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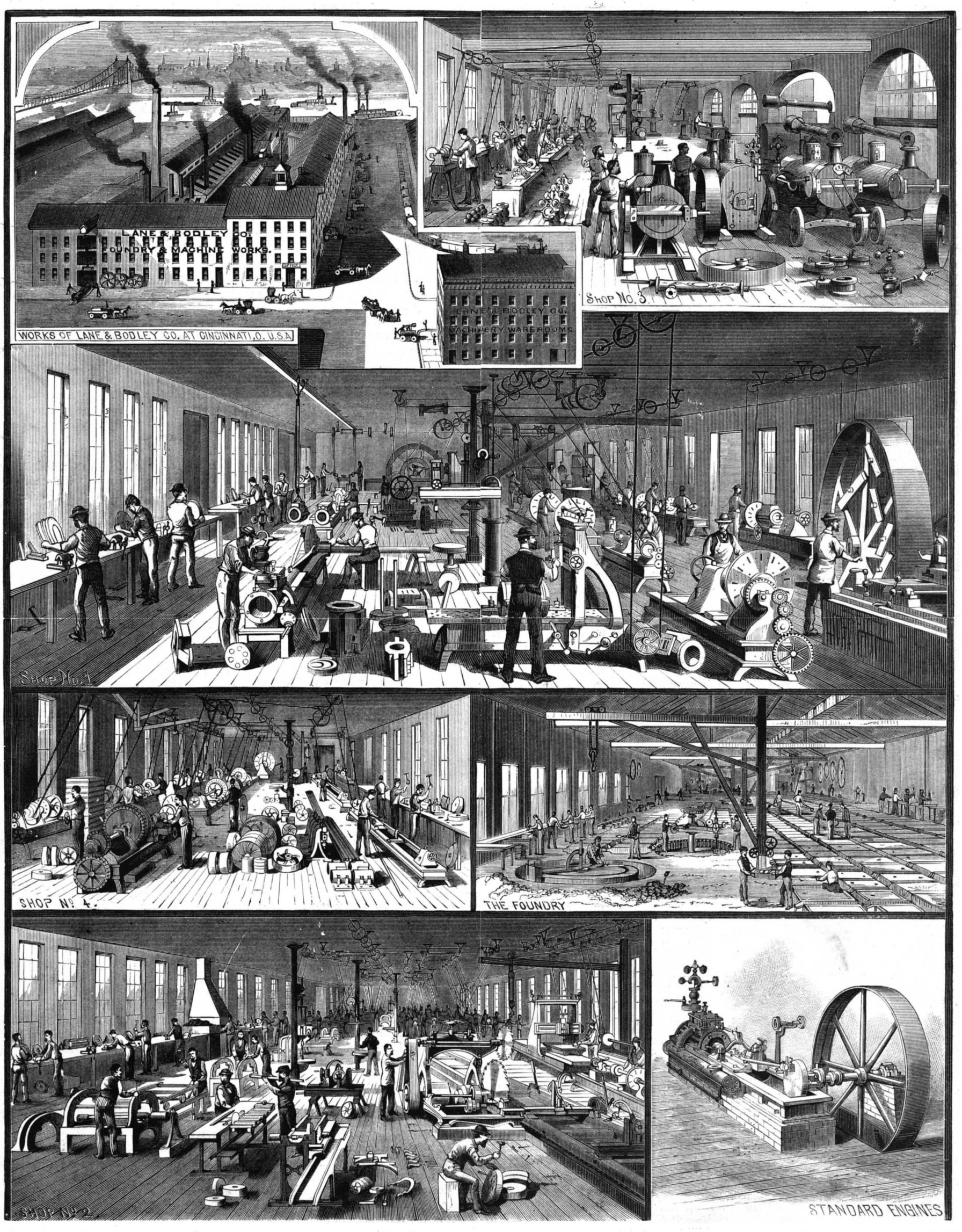

THE LANE & BODLEY COMPANY'S FOUNDRY AND MACHINE WORKS, CINCINNATI, OHIO.—[See page 19.]

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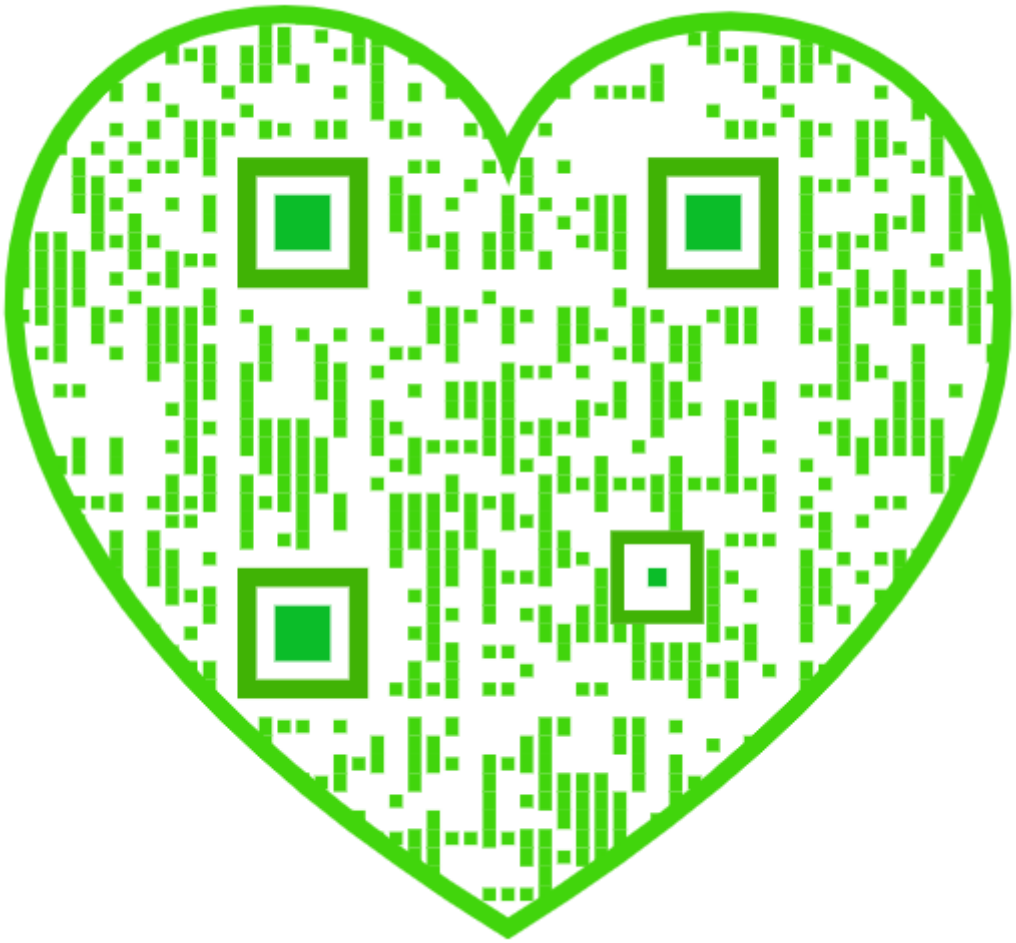

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NEW YORK, SATURDAY, JANUARY 14, 1882.

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INNOCENT PATENTEE VERSUS INNOCENT PURCHASER.

Speaking of those cases of conflicting patent rights arising from the issuance of two patents to different parties for the same invention (one of which patents is subsequently declared void by the courts), and the liability of the purchasers of articles sold by the owner of the rejected patent to pay royalty to the successful patentee, the Secretary of the Interior said, in his late annual report: "This is wrong, and in many cases tends to grievous hardship. It should be remedied by proper legislation, exempting innocent purchasers in open market from any liability for the use of such patented articles or devices."

That men who have once paid for an article or process and the right to use it, purchasing in good faith from one who could show the certificate of the Patent Office that he had at least a presumptively legal right to sell, should object to making a second payment to another is quite natural. And since such second liability usually arises through the action of the United States courts, in trials to which the "innocent purchasers" are not party, it is equally natural that they should look to the government for relief. For them the simplest way out of the trouble is a law exempting them from any responsibility to arise after the purchase is made "in open market and in good faith;" and several bills to that effect are now before Congress.

But the innocent inventor and patentee is a party to be considered in this connection as well as the innocent purchaser; and it is simply amazing that an officer in the responsible position of the Secretary of the Interior, in whose department the Patent Office is, should so completely overlook the obvious injustice and folly of attempting to right the wrongs of one class of unoffending citizens by increasing the wrong done to another class equally unoffending.

The case is plain enough if one will only consider it calmly and impartially. By oversight, erroneous judgment, or otherwise, the Patent Office issues to B a patent for A's invention, whether before or after giving a patent to A does not now matter. The person primarily wronged is therefore A, the rightful patentee. To a less degree B is wronged in that he is officially encouraged to manufacture and make a market for something which he cannot hold, and to defend his presumptive right in a legal contest with A. Having, it may be by long and expensive litigation, defended the right which the Patent Office has allowed to be infringed, A finds his right still further infringed by the public use of his invention under privileges sold by B, whose title the courts have declared to be invalid. The original error of the Patent Office now bears another crop of evil fruit. If the true inventor and rightful patentee insists upon the use and enjoyment of his own, the innocent purchaser from the defeated patentee must suffer the penalty of a second payment, with a possibility that a new claimant may some day establish his claim in the courts and demand another payment, and so on endlessly.

At this stage the Secretary of the Interior would have Congress interpose a bar to the successful patentee and forbid his enforcing the claim which the courts have so tardily made good, thus arbitrarily limiting a right which the Constitution of the United States describes as "exclusive." The excuse for this invasion of the patentee's right is the fact that an enforcement of it would tend to hardship on the part of certain unfortunate purchasers. As well might Congress be asked to interpose relief in all cases of hardship arising from the innocent purchase of property whose legal status is subsequently changed by court decision. It is a common occurrence for suits to be brought and successfully maintained for the recovery of property, notably real estate, under conditions precisely parallel to those arising in disputed patent cases.

Mrs. Gaines's recovery of large areas in New Orleans and other southwestern cities, after the land had changed hands several times and much of it had been improved at great cost by those who had purchased in good faith supposing their title good, is but one of many examples that might be given. The resulting hardships to those who were dispossessed were certainly as grievous as any ever caused by disputed patent rights; but we have never heard that the innocent victims have ever enlisted the services of a cabinet officer to recommend a law exempting them and all persons in their situation from liability to the rightful owner for rent, after the courts had decided in his favor.

Conflicts of right, entailing more or less of hardship to the innocent and unwary, must be liable to arise so long as public officers and courts of justice are human and fallible; but such conflicts are not more common in connection with properties based on patents than with other species of property, nor are the evils involved more general or serious. If there are good reasons for making an exception to the general rule of the law in the case of disputed patents for invention, it rests upon those who ask to have it done to make them known. To declaim against grasping patent sharks and deplore the wrongs of innocent purchasers simply begs the question. For the official head of the office, whose faulty working has given rise to the evils complained of (evils working hardship to the rightful patentee as well as to the purchaser under voided patents), to side with one party and advise his relief at the cost of the other, exhibits, to say the least, a grave deficiency in official sagacity. A wiser and juster course would be to study the practical working of the Patent Office to discover whether it may not be possible to prevent, or to largely diminish the frequency of the issuance of conflicting patents, the real source of all the trouble.

JOHN WILLIAM DRAPER.

Few names in modern science are more widely or honorably known than that of Dr. J. W. Draper, who died at his home at Hastings-on-Hudson, January 4. Mr. Draper was born near Liverpool, England, May 5, 1811. We present a portrait on another page. His taste for scientific investigation was developed early, chemistry being his favorite study. After studying some time at the University of London, he followed his family to this country in 1833, and completed his academic studies at the University of Pennsylvania, graduating with honor in 1836. Some of his scientific investigations having attracted attention, he was called to a professorship in Hampden-Sydney College, Virginia, where he stayed two years teaching chemistry, physiology, and natural philosophy. In 1839 he was called to the chair of chemistry and physiology in the University of New York, with which institution he has since been identified.

When the medical department of the University was organized Dr. Draper was chosen secretary, and in 1850, on the death of the first president, Dr. Valentine Mott, he succeeded to the presidency, filling that office until 1873, when he retired to give his attention to his literary work and his academic classes in science.

Notwithstanding the severe draught upon his time and strength demanded by his presidential and professional duties, Dr. Draper found time to pursue the scientific investigations which have gained him a place among the great leaders of intellectual progress in all ages. Indeed, in the broad scope of his researches and their direct and immediate bearing on human life and social progress, Dr. Draper exhibited rather the traits of the philosopher than the narrow characteristics of the specialist in chemical, physical, physiological, or historical science. Yet in all these departments his special studies were those of a clear-headed explorer and pioneer. His earlier studies in vegetable physiology were many years in advance of those of the rest of the scientific world. He led the way by twenty years into that marvelous field of research opened up by spectrum analysis. In his conception of the essential unity of radiant energy he was a full generation ahead of the physical investigators of Europe. As a philosophical historian, tracing the influence of material progress, association, and environment upon the natural development of nations and races toward civilization and rational thought, he was not less a leader and a worthy representative of the type of man toward which scientific civilization is making. Though in one respect what is known as a popular writer, Dr. Draper probably reached a wider range of active minds among all civilized peoples than any other modern writer, his principal treatises having been translated into most if not all of the leading languages of the world, some of them having been adopted as text books in the colleges of all nations, notably his "Physiology" and "The Intellectual Development of Europe." A minor, yet socially and industrially very important achievement of Dr. Draper, was in the early development of photography from life. In 1839 he secured the first sun-pictures ever taken of a living subject. He was also the first to photograph the moon.

A Fossil Stone Wall.

The Lexington (Ky.) *Press* says the workmen engaged in quarrying rock for Mr. Shannon, one mile from town on the old Frankfort pike, came upon a massive stone wall. It had every appearance of having been built by human hands, the mortar seams and joints being very plain. Above it about ten feet of drift and twenty feet of rock had been removed by the workmen, and on the side exposed the men had advanced fully forty feet from where they first struck rock. Thus it was firmly embedded in a solid limestone quarry, which certainly has formed about it since the wall was built. The face of the wall was well dressed, and its massive appearance gave evidence of the skill of hands perished long centuries ago, and could well be envied by the best of the stone masons of to-day.

[While there is no obvious reason for questioning the sincerity of this specific statement of the *Press*, we should be glad to see the report of some competent geologist upon the "fossil" wall]

Goats to Protect Sheep.

The farmers of Hunterdon and Somerset counties, New Jersey, use goats to protect their sheep from dogs. Two goats can drive away a dozen dogs, and two are about all each farmer puts in with his sheep. As soon as a dog enters the field at night, the goats attack him, and their butting propensities are too much for the canine, who soon finds himself rolling over and over. A few repetitions of this treatment causes the dog to quit the field, limping and yelling. Formerly, when a dog entered a sheep field at night, the sheep would run wildly around and cry piteously. Since the goats have been used to guard them, they form in line behind the goats and seem to enjoy the fun. The idea of utilizing goats in this way came from the West, where they are put in sheep pens to drive away wolves.—*N. Y. Sun.*

Electric Lights at Hell Gate.

The dangerous navigation at Hell Gate, the eastern entrance to the harbor of New York, causes a nightly blockade of vessels. To obviate this delay to commerce the Light-house Board has indorsed a proposition to provide Hell Gate with electric lights, and Congress has been asked to authorize the necessary experiments. The plan is unquestionably practical and cannot fail to be beneficial.

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EXPLOSION OF AN UPRIGHT BOILER.

Our illustrations represent a boiler explosion which took place on the 23d of December, 1881, at the old Risley Pottery, in Norwich, Conn., resulting in fatal injuries to Mr. George L. Risley, the proprietor, a respected citizen of Norwich. The works are located on the west bank of the river Thames, and adjoining the line of the N. L. and N. R. R., from the freight yard of which the view of the rear of the property, Fig. 2, was taken.

Fig. 1 represents the arrangement of the boiler and engine before the explosion, viewed from the interior of the wing basement, showing the position of Mr. Risley as he was attending to his boiler about 10 o'clock in the forenoon; he having moved from the position shown in Fig. 1, toward the engine further to the background, as though to oil or to observe the motion of the engine, when the explosion took place, as shown in Fig. 3, by the blowing down of the lower tube plate of the boiler, whence the scalding water issued, blowing him into the rear of the boiler room; and though he was shockingly and fatally injured yet he was able to drag himself from under the ruins; but on attempting to rise, by pulling himself up at the window opening in the leaning side of the building, he was observed to fall back exhausted. He was removed to his home, and revived sufficiently to tell a tolerably coherent story of the condition of the boiler as to water supply, etc., but died soon after. No other person was in the neighborhood of the boiler at the moment, although a man who acted as assistant manager of the works and salesman of the wares had about two minutes before left the boiler room.

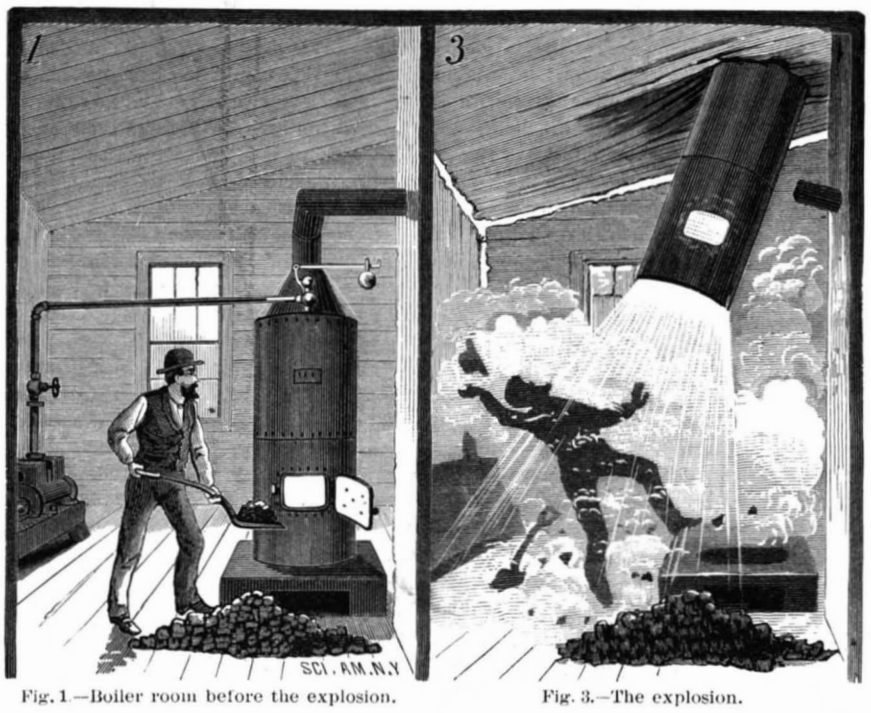

Fig. 1.—Boiler room before the explosion. Fig. 3.—The explosion.

EXPLOSION OF AN UPRIGHT BOILER.

This explosion, which was observed by a number of persons, especially the flight of the boiler over the large tree, was a characteristic one for this type of boilers, which, it will be noticed, is about the most common form of American stationary boilers for small powers. But they usually explode by collapse of the furnace sides. This boiler was three feet in diameter and seven feet high, made in 1867, as stated on a metallic card upon the front. The boiler was made of five-sixteenths plates, both shell and tube heads. It contained sixty tubes, two inches diameter, five feet long, which were set with a Prosser expander, and were beaded over as usual in this class of work. The upper tube head was flush with the top of the shell, and the lower one, forming the crown of the furnace, was about two feet above the grates and the base of the shell, and it was flanged upon the inner surface of the furnace walls. There was a safety plug in the lower tube head, which was not melted out, although, as is always the case when these plugs are so near the fire, a portion of the lower part of the fusible filling had disappeared. The boiler was provided with a brass safety valve, nominally one and a half inches, but the clear opening in its seating measures something more. The movable portion had no guide wings, but was kept in the axis of its housing by a long guide stem which passed upward through the high cap of its housing, and it was originally finished with a hemispherical end for the lever bearing; but the top had become bruised, and the lever had worn an irregular groove in which it rested, and thus as the valve rises from its seat the short arm of the lever is practically shortened by half the diameter of the stem, so that, after rising slightly, greater force would be required to sustain the weight of the load on the lever's long arm than that which would barely balance it while the valve was on its seat. The short arm was one and a half inches long, but the lever and weight being lost the long arm and load on the valve could not be determined. There was a fine-looking steam gauge with an open dial which exposed the interior to view through the glass, which was clean, bright, and uninjured; but this was in notable contrast with everything else about the boiler and its appendages. The gauge pipe had evidently been burst by freezing, and had been bandaged with rags to stop the leaks. It may have been frozen, and all communication with the steam room of the boiler cut off on the morning of the explosion; but this is hardly probable, because the pipe had been exposed to the warmth of the boiler room for three hours or more, or since 7 o'clock on that morning, when work is said to have commenced with the engine. Some wise persons said the gauge pipe *was* frozen, hence the explosion.

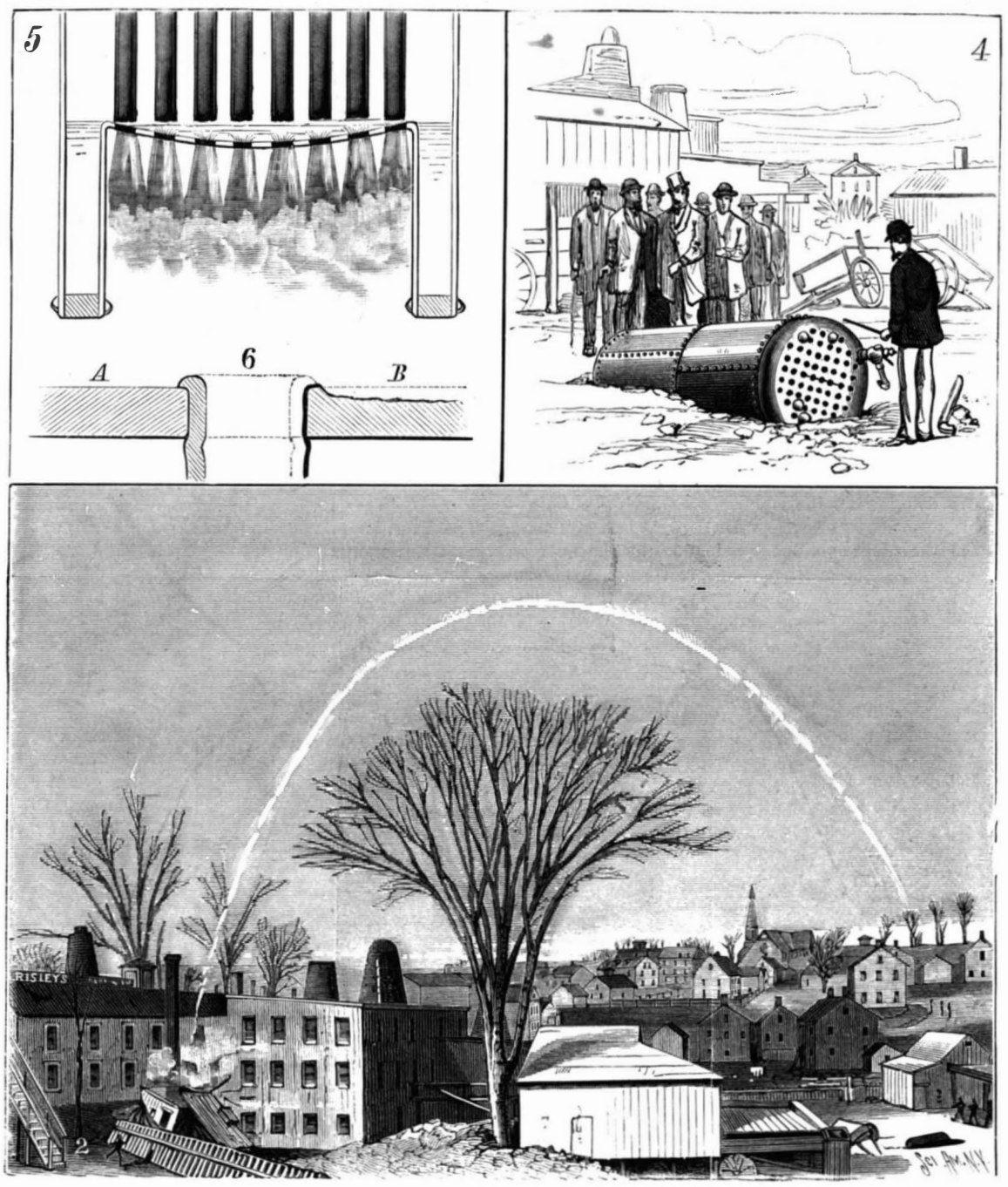

Fig. 2.—View of the Risley Pottery from the R. R. Freight Yard, and flight of the boiler. Fig. 4.- Boiler in the frozen ground after explosion, showing crack in upper head. Fig. 5.—Section of lower tube head and tube ends, showing the escaping water. Fig. 6.—A section of upper tube plate and tube end, B. The same corroded from leak, drawn full size.

EXPLOSION OF AN UPRIGHT BOILER.

The usual working pressure, as indicated by this steam gauge, was about sixty pounds per square inch, and, in the condition of the boiler, such a pressure with a boiler full of water would yield ample force to break open and send the boiler, as represented, over the top of the high tree, which it could not have passed in any other way than over its top, as sheds, wagons, and the trunk of the tree lay undisturbed directly in the line from the boiler house to the place where the boiler landed, and was buried one half its diameter in the hard frozen ground, as shown in Fig. 4.

There had been numerous leaks in the tubes at their setting in the heads and through their sides, and an examination of Fig. 4 will show that four of them had been plugged by means of washer caps at each end of the tubes and a bolt through each of the four tubes. There was a crack in the upper head (Fig. 4) near the center which extended between three tubes. From this crack, which had been leaking for a long time, the steam escaped, and the water resulting from its condensation, mingled with the gases from the furnace, had settled upon the surrounding surface of the tube head and the tube ends. This is one of the most active corrosive mixtures to which boilers are exposed. The result upon the upper head and tube ends was to reduce the five-sixteenths plate to less than a quarter of an inch in thickness and to reduce the tube ends to the thickness of writing paper. The illustration shows the section of the full tube end and plate as new, and also the condition caused by the corrosive action of the acid vapors and water. This defective condition extended over about one-third of the upper head. The lower tube ends had suffered still more from leaks in their setting and from holes eaten in their sides till they were as thin as paper and afforded no adequate support to the head. The pressure consequently forced the lower head down away from its tubes, opening fifty or more holes, two inches diameter, from which the fluid contents of the boiler issued at a high velocity, the water expanding into steamy foam, which, guided by the parallel sides of the fire box, formed an exit well adapted for a self-impelling projectile, and the whole boiler thus formed an immense rocket, weighing, when empty, about two thousand pounds. The way in which it landed shows that it kept nearly its upright position in the air, the top inclining slightly forward, till it struck the ground as shown, with its furnace toward the buildings. This boiler was, with all others in Connecticut that are not inspected by boiler insurance companies, under the care of a set of State inspectors, who are distributed in Congressional districts, and whose business it is to give certificates annually to all boiler owners who have safe boilers and to forbid the use of such boilers as are not safe.

What had been done by the local State official, who, it is said, has been an engineer, but is now a farmer living in the same Congressional district, no one seemed to know; but it is evident he had neglected his duty to this boiler. On making inquiries at a neighboring manufactory, it was ascertained that the State inspector hires a man to do the work of inspection, and, being a boiler maker, he often finds a job, and probably the cost to the official is not very high, and he simply signs the papers. In the case of Mr. Risley's boiler, which has of late been used but little, perhaps the inspection and condemnation which should have followed had been neglected. The inspections consist in testing by hydrostatic pressure from the city water mains, which afford a pressure due to about 200 feet head. The pressure is allowed to rise in the boiler to fifty per centum above the working pressure, when the water is shut off, and the boiler is passed as safe for another year.

Leaks may exist and the boiler go on corroding, but the inspector's work as officially performed does not include search for defects which may result in disaster before the year expires; and so the mystery of boiler explosions goes unexplained, while the official says it was all the fault of the fireman, who has, poor man! paid the forfeit for his carelessness. There was no appearance of low

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water or overheated iron here, although the SCIENTIFIC AMERICAN representative was told that the boiler was red hot when it struck the ground 120 feet away. The appearance of the fusible plug, with its filling still in it, did not seem to confirm this evidence of an eyewitness.

This boiler was fed with cold water directly from the city pipes, and near where it entered the boiler there was evidence, in the shape of leaks and patches on the furnace sheet, that it had suffered severely from this practice.

EARTH CONNECTIONS FOR TELEGRAPH WIRES AND LIGHTNING RODS.

When the return current in a telephone or telegraph circuit is carried through the earth it is, of course, necessary to make a very perfect connection between the line and the earth. When it is inconvenient or impossible to make use of water or gas pipes this is accomplished by the use of large plates of copper buried in the earth. Such plates are expensive, and they soon become oxidized so as to be almost insulated. The latter condition takes place still sooner with iron rods or plates.

In the use of strong constant currents, as for ringing bells on railways, etc., disturbances that are attributed to faults in the machinery or the batteries are frequently caused by imperfect earth connections. According to the *Electrotechnische Zeitung*, Gruener makes use of coke for grounding the current, as well as for the lower end of lightning rods. It possesses the advantage of durability and is comparatively cheap.

A massive block of fine grained coke has a hole bored in it a foot deep, and about 2½ inches in diameter. In it are placed some pieces of pure beeswax, which are melted by means of a blowpipe and alcohol lamp. This is continued until the wax is no longer absorbed into the pores in the walls of the hole. Then the copper wire, one-eighth inch in diameter, which is to serve as line closer, is inserted in the hole. It is made like a clasp at the end and bent upward and then downward. It is now heated by the blowpipe until the wax in the hole is boiling hot, and then carefully driven in until it touches the bottom of the hole. The vacant space around the wire is filled next with lead. Finally the upper edge of the hole receives a coating of hot wax, and over it a second one of tar or asphalt. The durability of the earth connection depends upon carrying out the above details carefully and accurately.

In laying the earth conductor the piece of coke that has been united with the copper wire, as before described, is buried in a hole about forty inches long and of the same width. Its depth will depend upon the amount of moisture in the earth at that place. It is embedded in fine earth, and a piece of lead pipe or tubing about one-eighth or one-quarter inch in diameter is slipped over the wire, its lower end in contact with the piece of coke, and long enough to reach to the surface of the ground. At the upper end a piece of larger pipe, about one or two inches in diameter and three inches long, is put over it, and filled with pitch or asphalt to prevent moisture from penetrating. About twenty-five or thirty pounds of coke, in pieces, is thrown in the hole around the big coke block and packed against it. Over this comes fine earth, on which water is thrown so it will fill up the spaces between the coke and adhere to it. The hole is finally filled with any kind of dirt or earth that has been taken out of it. At the upper end, too, the lead tube and wire is bent downward to prevent the water from entering it. It has been found that such earth connections do good service even in coarse material and tailings without the addition of fine earth. P. N.

PORTABLE COMBINED BATH TUB AND HEATER.

The engraving shows a portable bath tub, with an attached water reservoir and heating chamber, the reservoir and heating chamber having sufficient capacity to contain water enough to supply the bath tub with the amount of water ordinarily required for bathing purposes.

The water tank or reservoir is located at one end of the bath tub and elevated above it, so that the entire capacity of the tub is available to the bather, and so that the water contained in the tank, when heated to the desired temperature, can be admitted to the tub through an ordinary stop cock. The heating chamber adjoins the water tank, and is composed of inner and outer walls or casings, closed at top and bottom, forming a water chamber, and communicating with the tank through top and bottom ports or passages.

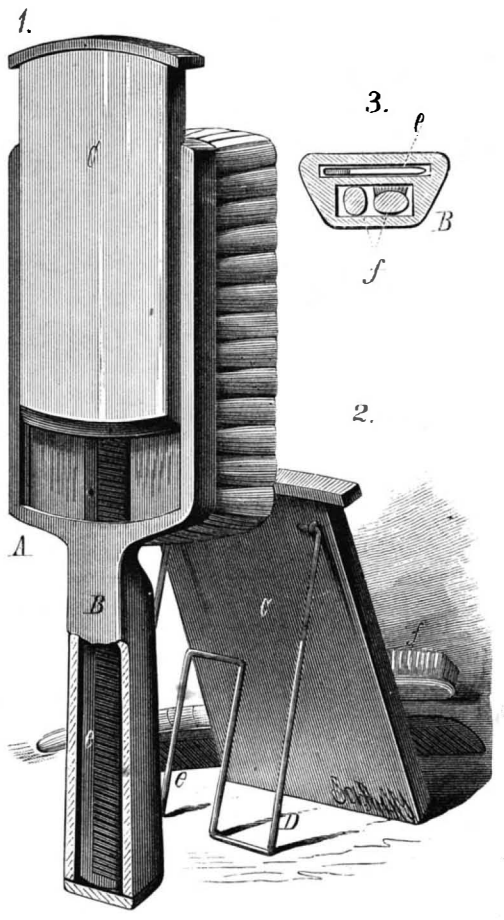
The central space formed by the inner walls of the heating chamber serves as a flue or chimney for the passage of heat from the lamp. This invention was lately patented by Mr. William Q. Prewitt, of Lexington, Ky.

The Largest Bell in England.

The long-promised big bell for St. Paul's Cathedral, in London, has been cast. Twenty-one tons of metal were used in the operation, and from three furnaces liquid streams were pouring for four and three-quarters minutes before the huge hole in the sand was filled. When dug out, the bell weighed 17½ tons, which makes it the largest bell in England and one of the largest in Europe. Following are the weights of other famous bells: The first big bell at Westminster, 15 tons 8 cwt.; the second 2 tons lighter; Great Peter, at York Minster, 10¾ tons; Great Tom of Lincoln, 5½ tons; the previous big bell of St. Paul's, 5 1/16 tons; that at Olmutz, 17 tons 18 cwt.; Vienna, 17 tons 14 cwt.; Erfurt, 13 tons 15 cwt.; Sens, 13 tons; Paris, 12 tons. It will not be possible to take the new bell to London by rail; it must go by horse road.

NEW TOILET COMBINATION.

The engraving shows a novel toilet article combining hair brush, tooth brush, mirror, and receptacle for various toilet articles. The brush, A, is chambered and provided with a hollow handle, B, for receiving a tooth brush, *f*, and comb, *e*. The cavity in the back of the brush is closed by a sliding cover, C, consisting of a mirror with beveled edges. This mirror has a wire brace, D, which folds closely against



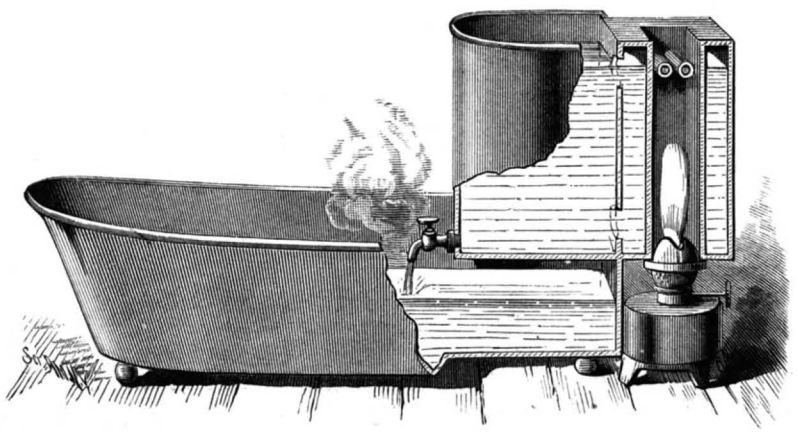
NOVEL TOILET ARTICLE.

it and is capable of being used to support it as shown in Fig. 2. Besides holding the comb and tooth brush the brush handle and back is capable of holding various other toilet articles, such as pins, hair pins, button hook, glove buttoner, etc.

This invention was recently patented by Messrs. I. N. Arment and A. E. Scott, of Dayton, Washington Territory.

Metallic Eliminations by Milk.

Dr. Lewald has, says the *Lyon Medicale*, investigated the elimination, by the milk of the mother, of iron, bismuth, iodine and its compounds, arsenic, lead, zinc, antimony, mercury—also alcohol, and several narcotics. His numerous experiments were made with the goat; a certain dose of the medicine was administered to the animal, after which the milk was examined—some of the results being as follows: A larger quantity of iron can be administered to the infant through the mother's milk than by any other means; bismuth, likewise, is eliminated by the milk, but in very small quantity; iodine does not appear in the milk until ninety-six hours after taking it, and the iodine of potassium, given in doses of forty grains daily, appears four hours after digestion, and continues to be eliminated for eleven days; arsenic appears in the milk at the end of seventeen hours, and its elimination had not ceased after sixty hours; though one of the most insoluble preparations, the oxide of zinc, is nevertheless eliminated by the milk, and it is probable that this is also the case with the other preparations of zinc.



PREWITT'S COMBINED BATH TUB AND HEATER.

MISCELLANEOUS INVENTIONS.

An improved straightway valve, which is free from serious defects common to the straightway valves heretofore in use, has been patented by Mr. Thomas J. Loftus, of Sacramento, Cal. In this improvement the valve casing is made with two ports, one at each end, and with a projection at each side, and contains two sliding gates having conical recesses in their inner or adjoining sides. These recesses contain a conical wedge which is swiveled to the lower end of the screw valve stem that has an annular flange which is also contained in the recesses and is overlapped by shoulders at the upper ends of the gates. The gates are lowered by the valve stem until they rest on the projections of the casing, and are then spread and pressed against the ends of the casing by the swiveled conical wedge, so that they will close the ports tightly. These gates cannot grind on the inner surfaces of the ends of the casing, as their movement is purely a lateral one when closing the ports, and replacing the outer surfaces will not cause them to drop any lower than before, as it does in other straightway valves.

Mr. Marion A. Wycough, of Batesville, Ark., has patented a case for holding and preserving documents. It consists in an oblong box having one of its sides pivoted in such a manner that an internal spring shall press the free end of the pivoted side against the contents of the box, to hold them securely in place while the box is being withdrawn or returned to its cell.

An improved alcohol cock has been patented by Mr. Clarence C. Mulford, of Streator, Ill. The object of this invention is to provide an improved spirit cock to be used in opening or thawing out gas service pipes which have been closed by the action of the frost, the improvement being adapted to perform such operation quickly and thoroughly without waste of the spirits used or escape of gas from the pipes; the invention also provides safe means for testing the condition of the pipes during the thawing operation.

An improved car seat, which can be converted into a double sleeping berth very rapidly and conveniently, has been patented by Mr. George Merz, Jr., of Denver, Col. The invention consists in a car seat having a board of half the width of the distance from one seat to the opposite seat, pivoted to the front and rear edge. These boards can be held in a raised position to form an extension of the seat by means of a curved rack brace or other pivoted brace, and the back of the seat having a board pivoted to its upper and lower edge, which boards fold on the inner or outer surface of the seat back and have folding braces pivoted to their ends, which braces are adapted to extend nearly to the outer or longitudinal edge of the boards, so that when the back is raised above the seat and the pivoted boards are raised to form extensions of the raised back, all the several parts are strongly supported and held in position by the folding braces of the pivoted boards, the lower ends of these braces fitting into notches in the arm rests of the car seat.

An improved window cushion, which is used as such when raised, and ornaments the space below the window on the inner side of the wall when lowered, has been patented by Mr. John C. Lackner, of New York city.

An improved end board for wagons has been patented by Mr. Jeremiah Park, of Montandon, Pa. The invention consists in an attachment or box provided with inclined sides of the same height as the wagon body, and having a slide in its inclined bottom, which attachment can be secured to or removed from either end of the body, as desired, whereby the capacity of the wagon body is increased without increasing its height, and commodities—such as corn, fruit, vegetables, etc.—can more quickly be unloaded from the wagon by moving out the slide and letting the commodity fall through.

An improvement in apparatus for chroming fabrics has been patented by Mr. Victor M. C. Lallemend, of Chester, Pa. In apparatus, as heretofore constructed, for chroming fabrics or raising plain black or other plain shades of color that need to be chromed after padding and drying, the pieces are washed by the bath and soiled by passing through the dirtied solution, so that the last pieces of a run are of a poor shade, and the liquor by that time becomes worthless. The bath, too, necessarily being a capacious one to obtain good results, the quantity of bichromate of potash and sal soda required for the solution has been very large. The object of the invention under notice is to avoid these difficulties. In it the goods are passed down at the front of and beneath a roll in a chroming box which is of the smallest size possible consistent with the space necessary for the required quantity of liquid. From said roll the goods are passed up to and between squeezing rolls, and from there given a protracted travel over rollers in a steam chest, and then conducted through a water box and afterwards through a second pair of squeezing rolls to a delivery roller. By this apparatus the fabric first comes in contact with the solution comparatively pure in front of the roll in the chroming box, and passes only once through the liquor, so that no coloring matter will be lost and uniformity of shade is preserved. The only waste of solution is at the completion of the work, and there is a large saving of material.

An improvement in the swinging tops of children's carriages, whereby they may be locked either in vertical position or inclined backward, has been patented by Mr. Charles M. Hubbard, of Columbus, O.

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AMERICAN INDUSTRIES—No. 80.

THE MANUFACTURE OF ENGINES, MILLS, MINING MACHINERY, AND WOOD-WORKING MACHINERY.

We give herewith illustrations of the extensive foundry and machine works of the Lane & Bodley Company, situated at the foot of John street, Cincinnati, Ohio. The machines manufactured at these works are sold in nearly every State in the Union, and there is a foreign demand from the East Indies, Russia, England, Sweden, France, Germany, West Indies, and South America.

Among the special lines of machinery manufactured by this company we may mention stationary and portable steam engines, boilers, grist and merchant flour mills, mining machinery, sawmills, shafting, hangers and pulleys, hub and spoke machinery, graduated stroke power mortisers, iron and brass castings, etc.

The works are divided into several departments, each of which is under a competent foreman, with tools and appliances especially adapted to the class of work to be done.

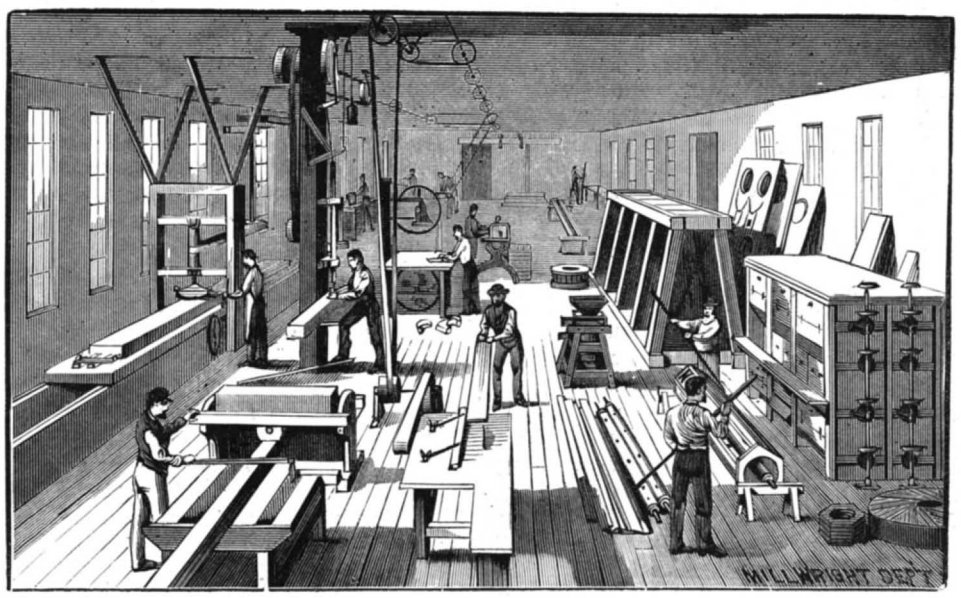
A large percentage of the product of this establishment is a class of machines which accompany the pioneer in opening up the vast wildernesses of our country to make homes for the coming millions. For example, sawmills are made by this company so simple and portable that the pioneer can transport them to his frontier home and propel them with horses (if no other motor be available), to furnish the small amount of lumber necessary to complete his cabin; or, if water power is at hand, simple appliances can be furnished to enable him to utilize the running stream to grind corn and to saw and dress the lumber, to complete the buildings, and to drive the machinery of the infant colony.

With the portable steam engines and sawmills made at these works, the railroad contractor cuts the timbers for the new railroad which pushes its way beyond the lines of civilization; and as soon as the whistle of the locomotive is heard in the virgin forests, the commercial demand begins. Naturally the first thing required is machinery for utilizing the resources of the wilderness to render the materials available for the various purposes for which they are required. The different kinds of machinery funished by this company are intended to meet such wants as these, and outfits are furnished with any required capacity.

We understand that this company was the first to construct a sawmill which could be profitably driven by the agricultural engines now so numerous in wheat-growing sections. This enables the owners of such engines to keep them profitably employed after the thrashing season is over, and thus save quantities of timber which would otherwise go to decay and be lost.

Nearly every farm in a timbered section reserves more or less of forest to supply them with firewood, timber, and lumber for future use; and with the agricultural engine and the Lane & Bodley Company's No. 1 sawmill the sawing of a neighborhood can be cheaply and profitably done.

The stationary engines made by this company range from eight to two hundred horse power. They are acknowledged to be the best of their class, and the demand for them often exceeds the means of supply. They are known as the center line, box bed, slide-valve engine. It has been the object of the company to produce a steam engine of the greatest efficiency and durability with the fewest parts, each part being easily accessible without disturbing any other. Another point has been to make it possible for any machine shop to make repairs cheaply, and not subject the owner to the expense of sending the engine or any of its parts to the builder for repairs. The department for manufacturing shafting, hangers, pulleys, couplings, gearing, and other appliances for the transmission of power, is as complete in its appointments as any in the country. Their pulley and hanger patterns, numbered by hundreds, are all constructed with due reference to the requisite strength, without excessive weight. They are made in all sizes up to twenty feet in diameter. This company has a fine assortment of new gear patterns, and they use a gear moulding machine, which enables them to make odd wheels with little expense for patterns. They have gear cutting and dressing machines that will handle wheels up to six feet in diameter.

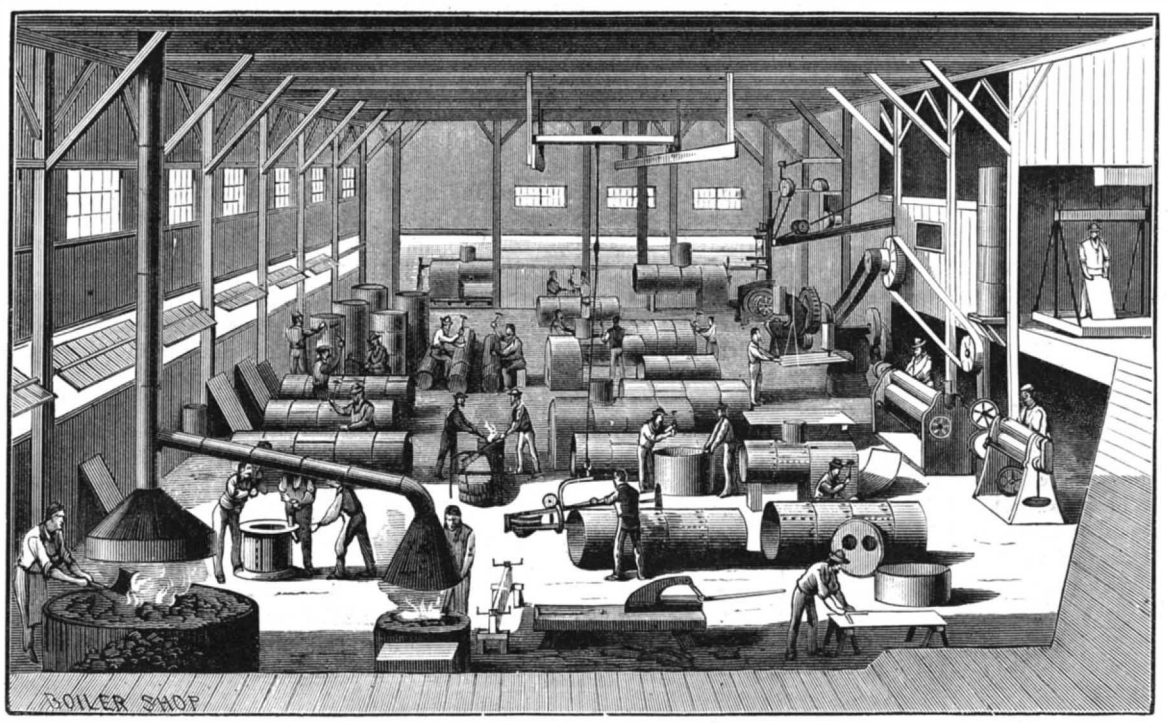


MILLWRIGHT DEPARTMENT.

The Lane & Bodley Company were the first Western manufacturers of the famous Blanchard lathe for turning irregular forms, such as ox yokes, shoe lasts, hobby horses, gun stocks, wagon spokes, etc. They have added many improvements to the details and minor parts of this machine, which make it a great favorite with all manufacturers of that class of goods.

They were the first to construct a power mortising machine with a graduated stroke, which made it possible to successfully mortise hard wood, such as wagon and buggy hubs, railroad car work, etc. These machines are now in use in all parts of the United States and in foreign countries.

The iron foundry connected with these works is one of the best machine foundries in the country. The building is 170 feet long, 70 feet wide, and 20 feet in the clear of trusses, and 35 feet from roof to floor. The boiler yard, smith shop, brass foundry, and pattern shop are supplied with modern tools, and the entire plant represents the best appliances of the day for the economical manufacture of the class of machines made by them.

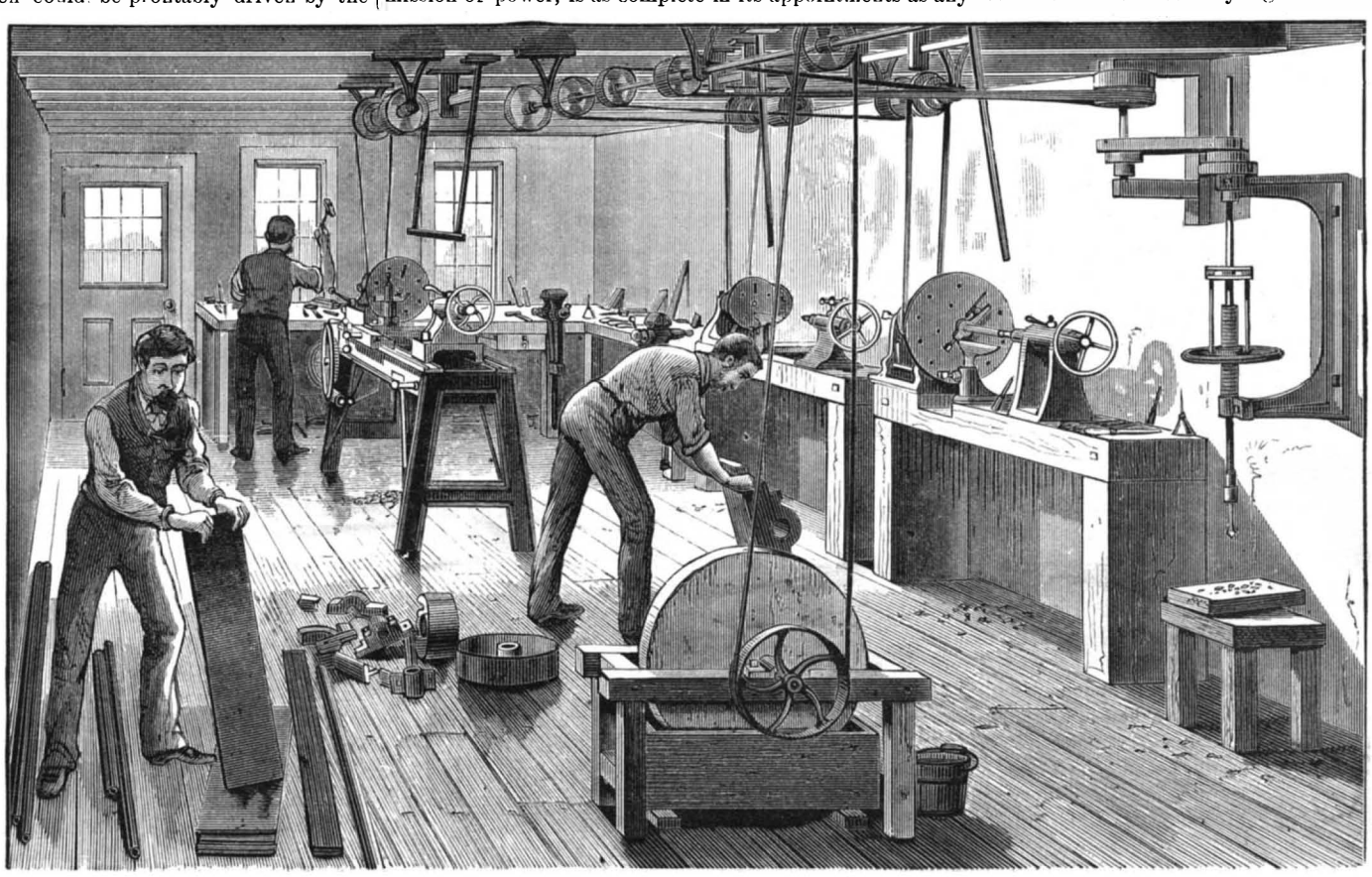


BOILER SHOP.

Cincinnati is one of the cheapest iron and timber markets in the country, and has always possessed an abundance of intelligent workmen. The central location geographically and as to food supply, great and rapidly increasing railroad facilities to coal and iron fields, give the manufacturing industries in this place superior advantages.

Since 1876 the business has been carried on as a corporate company, with a capital of $500,000, including real estate. P. P. Lane is president and C. F. Thompson secretary and treasurer.

The business was commenced by the president, P. P. Lane, in 1850, and in 1853 J. T. Bodley became associated with him as an equal partner, which continued until his death in 1868. In conversation with Mr. Lane, senior partner of this establishment, he said it was in the year 1850 that, being then a journeyman machinist, the evidences of this country's growth and development made him reflect upon the necessity of growing with it, and, if possible, to assist in the progressive movement. With that end in view, and a few dollars (altogether less than $500), and the ownership of two lathes of his own making—a single and back-geared hand lathe, mounted on wooden shears—and a few small bench tools, he purchased an engine or slide lathe for $200, from a furniture manufacturer, to be paid for afterwards in repairs of his machinery. A room at 196 Pearl street, Cincinnati, 15 x 30 feet, was then rented at $25 per month, with power from a co-tenant drug mill. A main line of shafting, suspended on rude hangers, was



THE OLD SHOP.

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added. This shafting was unturned, and it had flange couplings, the whole corresponding with the ideas of that period. Necessity required the addition of vises, three of which were procured, and of grindstones. For about a year the single-geared hand lathe answered the double purpose of a drill press and metal hand-turning lathe, after which further progress was manifested by the addition of an upright drill press.

This, then, is the complete shop of the firm of Lane & Bodley in the beginning of the year 1852. One of the views in our engraving faithfully represents the old shop.

It is worthy of remark that this firm, as usual with them, incurred no debts, nor was surplus capital solicited for any of the improvements; but each year paid for and added its fund for additional enlargement. The rapid change in the affairs of this company soon demanded greater room and more complete equipments.

In 1856 the establishment was removed, and one half of the second story of the present site occupied, which, being too small, was soon enlarged to two-thirds of the same floor. In 1859 the whole property at present occupied, 150 x 400 feet, came into the possession of the firm, necessity thus early showing their ultimate needs. Since that time warehouse property has been added, 40 x 120 feet, on the adjoining corner.

The drill press, boring, and slide lathes are yet in use in the shop, except that the boring lathe has a good iron shear in place of the wood, and are yet doing fair work. They are well cared for and preserved as souvenirs of the past.

In this interesting history of the development of one of our great industries, it is instructive and important to note the fact that a dollar of capital was never borrowed to advance the interests of the concern, and nothing in the way of capital, excepting that which has accumulated from the regular operation of the works, has been used. This capital has been freely devoted to extensions demanded by the business.

American Cars Lighted by American Electric Lamps in England.

A regular train of Pullman cars is now run upon the London, Brighton, and South Coast Railway, England. The train includes a parlor car, a drawing-room car, with ladies' boudoir and dressing room, a restaurant car, and a smoking car, while a compartment at each end of the train next to the luggage compartment is provided for servants. The cars are kept at an equable temperature by means of hot water pipes. There is electric communication between the parlor, drawing-room, and smoking cars and the restaurant car, and in many ways the comfort of passengers is provided for. The most important and novel feature of the train is, however, that it is lighted throughout by electricity.

The lamps used are Edison's incandescent lamps, 29 being used. On the very successful trial trip the electricity was supplied by Faure accumulators, of which 80 were carried. Mr. W. Lachlan, the engineer, representing the Société la Force et la Lumière, who was in charge of the batteries, reported that but 30 were brought into use on the down journey, and only a portion of the electricity stored in these was expended. On the up journey these and four fresh boxes were brought into operation. For the present the accumulators will be charged each evening at the society's depot at Charing Cross, but as soon as the necessary arrangements can be made it is intended that the recharging shall be done at Victoria with a dynamo machine worked by a small stationary engine. It is not improbable, however, that before long the electricity required may be generated on the train itself, the chief practical difficulty in the way of this saving of force arising, the London *Times* says, from the unavoidable alterations in the speed of the train—a mechanical difficulty in the way of charging the accumulators in this way which the ingenuity of the electrical engineers will no doubt soon overcome.

Chloride of Gold.

The mode of procedure is to dissolve the gold, throw it down to obtain pure gold, wash the precipitate, and redissolve. A solution of the salt is then obtained.

To dissolve the gold, a mixture of pure nitric and hydrochloric acids in the proportion of one to three is used. The usual manufacturers use an ounce of gold to four ounces of the mixture, though in our own practice we usually find double that quantity needed, as a considerable loss of chlorine takes place during the prolonged digestion. A porcelain or glass vessel should be employed, on account of the value of the contents. The kind we have found most useful is one that can be obtained from any dealer in chemical apparatus; in shape it may be likened to an egg with one end widened out. A useful glass vessel is made specially for such purposes, though we prefer the porcelain, particularly when the operations may not all be carried on by a principal himself.

This glass vessel is a bulb blown at the end of a long tube, and is so constructed with the object of avoiding waste through splashing. We place the gold in the porcelain vessel, pour over it the mixed acid, and put the whole in a sand bath; a tin canister almost filled with sand will answer all purposes. The whole is then put in a place where the fumes will not do any harm. The hob of an open fireplace is very good for the purpose, as the draught from the fire takes up the fumes, and the heat facilitates the dissolution of the metal. If such a place be chosen, care must be taken that no officious housemaid knocks the vessel and its valuable contents over.

In a few hours the gold will be dissolved. Should it not be, however, the liquid must be poured off and a fresh supply of acid put upon it, and a gentle heat again applied. When all is dissolved the liquid is next to be transferred to an evaporating dish, which should again be placed upon a sand bath and heated till the bulk of the liquid is driven away. It must not be made *dry*, or there will be a loss of gold by the production of an insoluble salt; and, further, for the after operations it is desirable to have some quantity of acid present.

The solution being thus brought to a small bulk it must be transferred to a precipitating glass, water added to reduce its strength, and a filtered solution of sulphate of iron poured in. For safety two ounces of sulphate may be added for each sovereign piece. A deep brown precipitate, sometimes appearing green when looking through the vessel, is then produced; it is pure metallic silver. This must be allowed to settle till the supernatant liquid is quite clear, and when this happens in may be poured or siphoned off, fresh pure water added, the precipitate stirred and allowed to settle, the fluid again poured off, and water added, etc., till all the iron is washed away. The precipitate then may be transferred to the porcelain holder again, and either heated to drive off the water or allowed to stand till the precipitate occupies a small space, when almost all the water may be removed.

All that is now required is to redissolve this precipitate in the smallest possible quantity of acid and slightly to evaporate, when a solution of acid terchloride of gold, or chloride of gold and hydrogen, is at hand, and it may be kept, with a little water added, with far more convenience than if it were in the solid state.—*British Journal of Photography.*

A Plague of Worms.

The workmen employed in the St. Gothard Tunnel have all suffered from a painful disease not due in any way to the nature and conditions of their labors. In a memoir just published Dr. Bugnion traces the disease to the presence of the parasitic worms in the intestines of the subjects of the malady. This nematoid worm (*Ankylostoma duodenalis*) was first discovered in Milan in 1838; it has been met with in various parts of Italy; is extremely abundant in Egypt, and it has also been found in Abyssinia, India, the Sunda Isles, Rio de Janeiro, Cayenne, and the Antilles. In the intestines of the first tunnel workman who died of the disease (at Turin Hospital), more than 1,500 individual worms were counted. Many workmen have been severely afflicted, but the extent to which health must be compromised is strikingly indicated by the fact, stated by M. Bozzolo, that he found eggs of *Ankylostoma* in the stools of all workmen he examined without exception. The creature has prodigious fecundity. Happily the eggs are not developed in the person who harbors them; the development begins in the excrement or the moist earth, and gains admission to the intestines with unwholesome water.

Large numbers of laborers from the regions which furnished the workmen of St. Gothard have been brought to this country to engage in railway construction and similar rude employments. They bring their careless and uncleanly habits; and there is danger of their defiling springs and water courses where they are camped, and so spreading the worm pest along the lines of new railways.

The Largest Clock in the World.

The great Parliament House clock in London, England, usually called the Westminster clock, the largest clock in the world, says Mr. W. A. Hendrie, in the *Watchmaker and Metalworker*, was contracted for in the year of our Lord 1847, and started running in 1859, and started striking in July of the same year, although the construction was nearly completed in 1854 by the first Mr. Dent, a big name among watch and clock makers at the present day. The architect was Sir Edmund Beckett Dennison, who, as a designer in horology, has ably proved himself on the top perch.

The clock in its general design is of that kind known as the platform kind, and its plates measure 16 feet over all; the ends are built into the wall, while the bracing resembles the trussing of our bridges. There are three trains of wheels: the time train in center; hour strike train on the left; quarter train on the right. The main wheels are 40 inches in diameter, while the cam lifters for hammer tails are 38 inches diameter. There is only one cam lifter on main hour wheel, with 10 cams and 3½ inch faces of steel. In this connection the above strength is necessary on account of the weight of the hammer to be raised (420 lb.) to strike the great 15-ton bell. The quarter chime hammers are much lighter, being in proportion to the bells to be struck by them. There are four, and they weigh from 3 tons 18 cwt. down to 1 ton 1 cwt. The diameter of hoop wheel is 30 inches, and the flies are in the usual proportion, but as the flies are driven with one pair of miter wheels to throw them on end and reduce friction, the flies proper resemble a large sized barn door, and the way they make the wind blow is awful. I will now describe the time train.

The main wheel is 28 inches diameter, while the barrel is 16 inches, with a capacity for 2 feet of line. Great wheel has 180 teeth; center 120; third 120, with pinions of 12, 16, and 9. This brings me down to the escapement, which is the far-famed one—the gravity. This one is called the three-legged, and is formed of two wheels with three teeth each on same arbor, with space between, and in this space comes the lifting pallets, which are driven by the weight, and as soon as the pendulum swings against the partly lifted pallet it is released, thus allowing the pallet or arm to propel the pendulum on its opposite passage, where the same action takes place and a corresponding impulse is given. This escapement takes away all imperfections of trains, as the weight or pallet arm alone gives impulse. This clock beats two seconds; length of pendulum, 13·064 feet from suspension to line of oscillation; weight of ball, 685 lb.; length of suspension spring, 5 inches, 3 inches wide, and one sixtieth of an inch thick; glass used in dials, 2¼ tons, and with iron cost £5,334. Going part takes 20 minutes to wind; depth of well for weights, 174 feet; clock frame 4 feet 7 inches wide; dials 22½ feet diameter; weight of minute hand, 2 cwt.; length, 14 feet; the pendulum rod is compensating, with an appliance for regulating. The cost of this clock, in addition to dials and hands, as above noted, was a little under £3,400, making the clock when finished cost the sum of £8,734.

The writer of this will never forget the beautiful sounds of the bells which the clock gives out when striking. The large bell is heard ten miles off, and the small ones four to five. This clock is reported giving an error of only 90 seconds per annum; but the appliance for regulating by making it faster or slower, as our city observatory does, debars us from forming an idea what it might be if left alone for one year.

On a New Mode of Separation of Oxide of Iron from Alumina and Titanic Acid.

BY MR. ANTONY GUYARD (HUGO TAMM).

Analytical chemists know what difficulties attend the separation of oxide of iron from alumina and titanic acid by the methods usually employed in analysis.

With regard to the separation of oxide of iron and alumina really scientific methods require the use of elaborate apparatus and a considerable length of time, two elements which seriously interfere with the course of analysis which, in our days, where it is so much used for practical purposes, must be done with accuracy and at a short notice.

The separation of large quantities of alumina from small quantities of oxide of iron presents no serious difficulties, and the usual mode of separating those two substances by means of a solution of a caustic alkali is sufficiently accurate; but this physical mode of separation fails altogether so soon as the proportion of oxide of iron is increased, and when the proportion of alumina is small even fusion with alkalies effects but an imperfect separation.

Meanwhile the research of small quantities of titanic acid often proves fruitless when the known or chemical methods are employed.

The writer has for a long time been on the lookout for a true chemical method of separation of these substances, and has succeeded in devising the following, which offers most of the advantages needed in analysis:

The mixture of oxide of iron, alumina, and titanic acid obtained in the course of the analysis is calcined and weighed, and then dissolved in strong hydrochloric acid. Iron must be reduced to the state of protoxide, and this is best effected by means of a concentrated solution of hyposulphite of soda. A slight excess of this substance may be added without inconvenience.

The solution thus obtained is neutralized partly by means of ammonia or carbonate of soda and then precipitated by means of a solution of cyanide of potassium, which must be added in slight excess. The whole is then boiled and iron is completely dissolved in the state of ferrocyanide of potassium.

When the floating alumina, or mixture of alumina and titanic acid, is perfectly colorless, a small quantity of ammonia is added, as well as a few drops of sulphide of ammonium. The floating oxides should remain perfectly colorless and not assume even the faintest blackish or greenish tinge, showing that the separation is absolutely perfect.

The whole is then filtered and well washed, and alumina, titanic acid, and the almost ever-present phosphoric acid are separated and estimated by one of the known processes.

In this method iron had best been estimated by difference, or else determined by some distinct process on some other portion of the mixture.

Until now it was alumina which was thus estimated, and chemists will thus readily perceive how advantageous is this new method which enables them to see and to handle the alumina or the group of substances which is too often reported as alumina.

One of the advantages of the process is the facility with which even minute quantities of titanic acid can be detected and estimated.

In scientific or very delicate analyses the use of volatile reagents should be resorted to as much as possible, and in consequence hyposulphite of ammonia and cyanide of ammonium should be used to effect the separation here described. In this case, after boiling the solution of ferrocyanide of ammonium to expel any excess of cyanide of ammonium, iron might be estimated in a direct way in the state of ferrocyanide.

The new method is invaluable for a perfect separation of iron from titanic acid in the proportions usually found in titaniferous iron ore, separation which is extremely delicate by the known processes.

The writer expects that the same method, with perhaps slight modifications, will prove useful in the separation of iron from substances other than alumina and titanic acid, but further researches are needed.

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Uses of Compressed Air.

A paper was lately read before the Society of Arts by J. A. Berly, on the "Distribution of Time by a System of Pneumatic Clocks," heretofore described in the SCIENTIFIC AMERICAN. In this paper the author enumerates some of the many purposes for which compressed air has been employed. Air, compressed at pressures varying from a little over up to over a hundred times above the atmospheric or natural pressure, has, and is used in reference to, among many others, the following processes or manufactures:

The blowing of glass and bottles, etc.

The blowpipe, so much used in chemistry and industrial processes.

The "blow cane," for killing birds, as used by the natives of Guiana for killing paradise birds without destroying their valuable feathers.

The common bellows used for firesides; in the slaughtering houses, etc., and also in blacksmith shops, etc.

The blowing of organs.

Blasting in foundries, forges, cupolas, etc.

Diving Bells.—A description of this apparatus, in its primitive form, is given in Aristotle's "Problems," as far back as in the fourth century B.C.

Diving Dresses.—Those have almost superseded the diving bells, which only allowed the workers, or divers, to extend their operations over a very limited area at one time, when, with the diving dress, the worker is capable of moving to and fro, having only to carry with him the pipe which conveys to his mouth the air compressed at the surface by means of pumps of special description.

Sinking Bridge Piles.—With the progress of metallurgy, the construction of metallic bridges come gradually into use, as also the use of cast iron tubular pillars. Air compressed at a pressure sufficient to keep the water out of the pile during the process of sinking, in order to enable the workmen to work at the bottom of the water, is forced into the tubular cast iron pipe and maintained at the required pressure, the top part of the cylinder being shut, and a special contrivance or air chamber provided for the letting in and out of the men and materials excavated.

Floating Sunken Vessels.—Various devices are in existence for floating sunken vessels, the means generally employed being the pumping out of the water contained in the hold, combined with the use of air bags surrounding the vessel, to which they are attached in suitable positions by divers.

Locomotion.—We have examples of railway locomotion by means of air pressure in the atmospheric railways of St. Germain, in France, which was at work in the year 1847, and of Dalkey, in Ireland; also in the compressed air locomotive of Mr. Ribourt, a French engineer, as constructed at the Creusot works, and used in the St. Gothard tunnel works, and of that of Lieutenant-Colonel Beaumont, as tried at Woolwich some time ago.

Brakes.—Powerful railway brakes, now well familiar to us, are also worked by air pressure, such as the well-known Westinghouse compressed air and Smith vacuum brake.

Tramways are also worked by compressed air, and the most successful of the existing system is, judging by the number of applications which it has received, the Mekarski system, in which the air, compressed at a very high pressure (and which is carried in cylindrical receivers attached underneath the tramcar), instead of being used alone, is caused, before producing its expanding effects, to pass through boiling water, a load of which is also taken with the tramcar on its starting journey.

Rock Drilling.—The drilling of holes for blasting rock by means of gunpowder or dynamite in mines, quarries, and tunneling, is also effected by means of air compressed by machines actuated by steam engines, water wheels, or turbines, at the surface of the works or entrance to the tunnels, stored into proper receivers, and conveyed to the perforators or rock-drilling machines at almost any distance, in any direction, and at any altitude, by means of pipes connecting the air receivers to the said perforators. The tunnels of the Mont Cenis and the St. Gothard, one over eight and the other over nine miles in length (14,920 meters), have been evacuated throughout by means of such machines so worked by compressed air.

Coal Cutting.—For working coal-cutting machines underground in the same way as rock-drilling machines are worked.

Transmission of Power.—For transmitting power in any direction, at any distance or altitude; any ordinary steam engine, steam winch, steam crane, etc., being capable of being actuated by compressed air in exactly the same manner as the said engines, machines, or apparatus can be actuated by steam.

Ventilation of mines and public buildings.

Pneumatic Post.—Messages are now carried from one place to another, through underground, in some of the most important European capitals—London, Paris, Berlin, Vienna—vacuum and compressed air being used for the purpose.

The use of compressed air is also brought nearer home to us in our daily dealings in the shape of pneumatic bells, apparatus for opening doors (as used by the Paris *concierges*), spray producers, fountains, air guns, toys, etc.

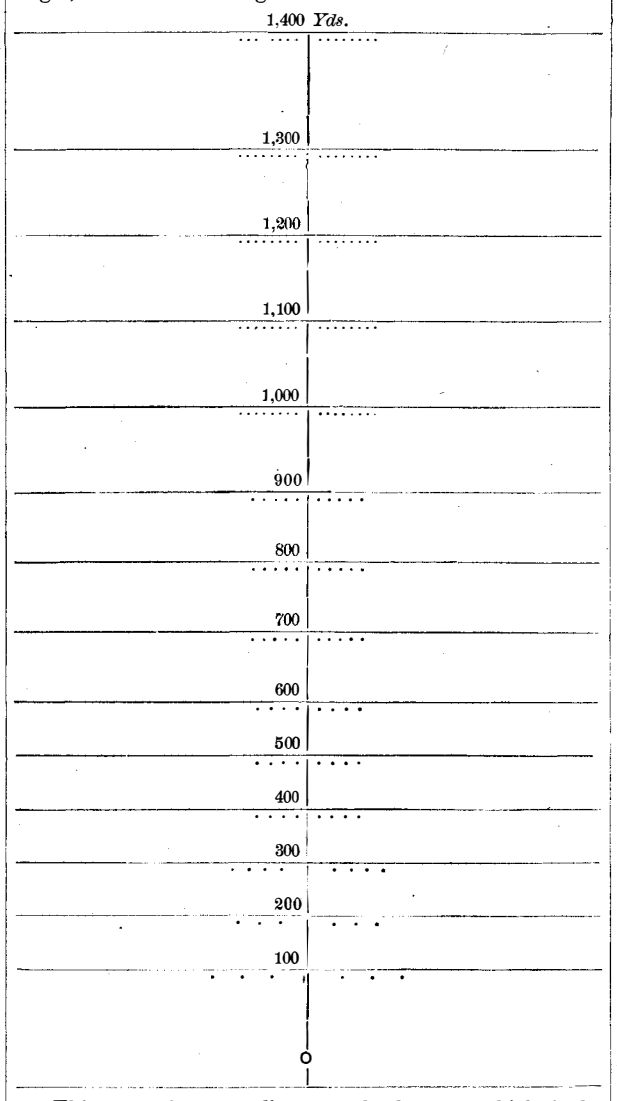
Compressed air is also used in sugar manufactories, breweries, iron and steel works (the blowing engines in these last being a very important feature in the processes of metallurgy); also for artificial ice making and cold producing, as in the Giffard process, in which the cold resulting from the distention of compressed air into the atmosphere is utilized: in submarine vessels, propelling of torpedoes, pneumatic dredgers, such as the Duckham's, the Bazin's, the C. Ball's; water lever indicators, and, finally, in a variety of works, processes, and purposes which it would take too much time to describe.

The author suggests that an exhibition of the various industries connected with the use of compressed air be held in any convenient spot. It is his opinion that it would prove of an immense interest, and attract almost as much attention as the electrical exhibition of Paris, so numerous and varied being the valuable ends to which it is applied.

New System of Aiming and Sighting.

The *United Service Gazette*, describing a system of aiming and sighting devised by a Mr. Morris, says:

"All musketry instructors know what dreary work aiming drill is, and how it is hated by both officers and men; indeed it may be said to be given as a punishment to bad shots. Moreover, as at present practiced, it is very nearly useless, because it does not test a man's aim at the moment of firing. Mr. Morris's system teaches the recruit the why and wherefore of raising the sight, and makes him dexterous in its manipulation. Mr. Morris' apparatus consists of a most accurately made rifled tube, which extends the whole length of the rifle. This tube is fixed in the rifle in such a way that the loading and extracting are precisely the same as with the service ammunition. A tiny cartridge is fired at a paper target, with lines crossing it thus:



"This target has a small spot at the bottom, which is the point to be aimed at. If a paper target is placed in the line of fire, and the soldier is made to aim at one given spot on this target, it is evident that the bullets will pass through the paper at places corresponding to the elevation of the rifle. When he puts up his sight, say to 500 yards, and aims over it to the spot at the bottom of the target, he unconsciously raises the muzzle of the rifle, and of course the bullet hits the target, at a place higher than when he was aiming at the same spot with the sight fixed for 100 yards. The places where the bullets should hit are shown on Mr. Morris' target by the horizontal lines, and the lateral deviation is shown by divisions marked on the horizontal lines. Mr. Morris' plan enables every man to use his own rifle in the barrack room or yard, at distances varying from ten yards to one hundred. The cost of the introduction of this system of musketry practice is so small that every battalion of the British army could, it is estimated, be supplied with twenty of Mr. Morris' tubes for less than £3,000. The price of the ammunition is very low, as the cartridge cases and lead are all recovered. Further, if the government supplied this ammunition to the men at one shilling per hundred rounds, many men would buy it, as matches can be shot on Mr. Morris' system exactly the same as at the regular target. Mr. Morris' invention has met with a very favorable reception at the Horse Guards, and it is hoped that this most useful invention will soon be in general use in the British army and navy."

Mineral Tanning.

The new form of tanning, in which mineral salts take the place of tannic acid for preserving hides, is thought by some to be an improvement on the old process, while others say it is not a success. It is probable that some time will elapse before the new method will reach that perfection which will secure for it general recognition. Ihrig, in a recent lecture on the subject, said that shoemakers and chemists had expressed doubts in regard to it, and even the mineral tanners, many of them, agree that the old method of bark tanning is not going to be driven out of the world just yet; that mineral tanned leather is at present not fit for the parlor and never will be; it does not last as long as ordinary leather, not to speak of the finer leather; without the use of oak bark there can be no leather that is not poor and cheap; the new method will go out of use, as many new things have done before. This, he said, was the average opinion of practical as well as scientific men.

Reuss, in Aschaffenburg, has been experimenting upon the new leather for two years, and, in the *Gerber*, he says it cannot compete with bark-tanned leather. It must be admitted that mineral or chrome leather is an advance, and that it is distinguished for being waterproof, and seems excellently adapted to certain uses, such as belting. For softness and external appearance it is far behind the other leather; neither will it take a polish like it. When we remember that in the old process the easily decomposable substances in the hide are all gradually removed, while in mineral tanning they are only partially destroyed, this, too, must make a difference.

Glycerine Leather Polish.

Mix intimately together 3 or 4 pounds lampblack and ½ pound of burned bones with 5 pounds glycerine and 5 pounds sirup. Then gently warm 2¾ ounces of gutta percha in an iron or copper kettle until it flows easily, then add 10 ounces of olive oil, and, when completely dissolved, 1 ounce stearine. This solution while still warm is poured into the former and well mixed. Then add 5 ounces gum senegal dissolved in 1½ pounds water, and ½ ounce of lavender or other oil to flavor it. For use it is diluted with 3 or 4 parts of water. It is said to give a fine polish, is free from acid, and the glycerine keeps the leather soft and pliable.—*Polytech. Notizblatt.*

Heating Gas Distribution in St. Louis.

At the intersection of Clark and Tayon avenues, St. Louis, two square brick buildings of little apparent significance have been erected during the past few months. One of the buildings, situated on the northwest corner of the above thoroughfares, is evidently intended for an office. The adjoining structure, however, is constructed in a manner that immediately claims the attention of a close observer. It is a small, unpretentious building, measuring only 29 x 41 feet, ground measurement, with an altitude of 35 feet. The roof is of iron, with a rectangular opening on the ridge, surmounted by an iron ventilator. The basement is deeper than ordinary, and through the lower windows glimpses are gained of massive cylinders, connected by a bewildering array of immense tubes with a number of upright boilers. Their purpose cannot be explained by any of the well-known principles of mechanics, as the complicated arrangements conform to no acknowledged mechanism seen in operation in that city.

Inquiry divulged the fact that the building was the central establishment and headquarters of the St. Louis Heat and Power Supply Company, a close corporation, in which the stockholders are members of the firm of Shickle, Harrison & Co., and Eastern capitalists interested in the introduction of a patent for distributing hydrogen gas for heating and power purposes. The gas is manufactured under the Low process, which has been successfully applied in Yonkers and Winchester, N. Y. Mr. John Atkinson, late engineer and superintendent of the St. Louis Gas Company, is in charge of the works, and from him a reporter obtained the following information.

The works are the largest and most extensive in the country, and when in operation will have a capacity of 300,000 cubic feet a day. The gas is not adapted for illumination, and will only be supplied to tenants requiring it in place of coal for heating, steam generation, and running gas engines. It will be formed under pressure, and at a cost of $1.50 per 1,000 cubic feet.

The process of its manufacture can be briefly illustrated as follows: Anthracite coal is fed to an upright generator, where it is worked up to a white heat by the agency of a blower, which is driven at a high rate of speed by a 50 horse power engine. As soon as the coal arrives at the proper heat, superheated steam is admitted, and, impelled by the pressure of the blast, passes through the furnace and thence through superheating chambers and carbureters. In the passage the generated gas is washed and after passing through a series of tile pipes is returned to the condenser ready for distribution to the consumer. The surplus supply is conducted to a gas holder in the yard, which has a capacity for storing 30,000 cubic feet.

The power required in manufacturing the gas is supplied by a 60 horse power boiler and an ordinary engine of the same power. After operations begin the steam engine will be supplemented by a gas motor. Connection will be made with manufactories through ordinary 15-inch iron pipes, which will be laid underground in the same manner as gas pipes. For private houses and hotels, where the gas will be used as fuel, smaller mains will be employed. The condensation is so small that it is not considered necessary to incase the pipes in asphaltum, cement, or any other non-conducting material, and it is claimed that an efficient service will be obtained by these means.

The company at present only contemplate supplying gas in their immediate vicinity, and will under no consideration

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extend their system so as to reduce the supply to tenants. They propose to build additional depots in the manufacturing districts as soon as they have practically demonstrated the feasibility of their plans. The erection of the works have been retarded by the freight blockade, which detained a quantity of machinery, but if nothing unforeseen occurs an experimental test will be made next month. Pipe laying will be begun this fall, and if the winter is favorable gas will be let into the system of tubes early in the spring. Applications for supplies are already in excess of the capacity of the company to meet.

Cellars as Centers of Malaria.

Dr. C. R. Agnew, writing from Florida, says: In this State a somewhat new problem presents itself, in the fact that all houses should be constructed without cellars, and so raised on underpinning as to allow a clean sweep of light and air beneath them. Indeed it is a question whether such a mode of construction should not be adopted everywhere for dwellings. I have for more than twenty years believed that cellar atmosphere is a most prolific cause of disease and death. I believe that it increases seventy-five per centum the risk from malarial disease all over our country. Through this State the native population, as by an instinct, raise their simple cabins three or four feet above the ground, and allow air and light to pervade the space so made beneath the ground floor. I advise all travelers to avoid those hotels and other domiciles in the South which are not so constructed.

Blue Milk.

The blue appearance which milk sometimes presents after standing a few days is due to an organism which is allied to bacteria, and can be transplanted into other samples of milk and various solutions. It thrives according to the proportion of acid present and the condition of the casein; it appears after a certain degree of acidification has taken place, and prevents the further formation of acid. The casein must also be unchanged; it is then held in solution during the bluing process. The bluing occurs only in presence of oxygen, and is attended with evolution of carbonic anhydride.—*F. Neelson, in Bied. Centr.*

IMPROVED UNIVERSAL CHUCK.

In general construction the chuck shown in the engraving resembles the universal screw chuck, the jaws being moved

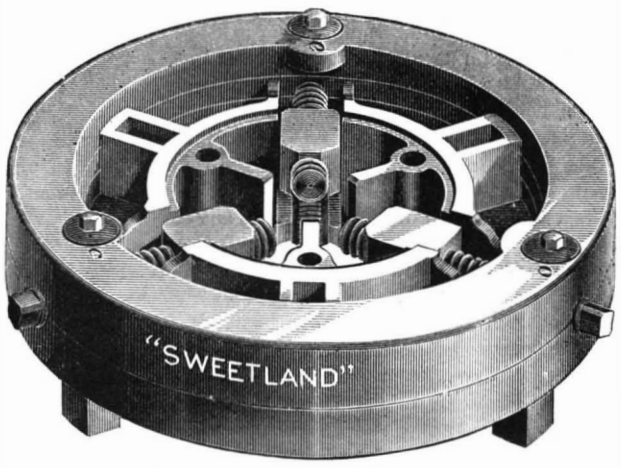


Fig. 1.—THE SWEETLAND CHUCK—BACK VIEW.

to and from the center, universally, by means of geared screws connected with the circular rack which revolves in a recess in the back plate. The front and back plates are bolted together, thus incasing and protecting the gearing.

The design of the improvement is to make the chuck independent as well as universal, and reference to the accompanying engravings illustrates the means employed to attain this object.

Fig. 1 represents the entire mechanism of the Sweetland chuck, showing plainly the circular rack and pinion screws connected at *o* and disconnected at *c*. The recess in back plate is made deep enough to disconnect the gearing. In the recess, and underneath the rack, lie the cam blocks, beveled to correspond with the continuous bevel recess in the back of rack, as shown in Fig. 2.

These bevel cam blocks have radial motion, and when moved to the outer portion of the recess and rack they connect the gearing, making the chuck universal; and when they are moved inward, allow the rack to disengage from the pinion, thus making each screw independent.

The cam blocks are held in place by the convex spring washers, *o*, *e*, *c*, which allow them to slide to or from the center without disturbing the nuts, the friction being sufficient to hold them in place.

The jaws have a long bite on the inner end, are strong in the nut, which has a full thread, and can be taken out of the chuck, for the purpose of cleaning, without removing it from the lathe. They are ground perfectly true on face and bite, also outer end, after being case-hardened.

There are lines on face designed as a guide for setting the jaws true. For instance, the chuck having been used independent, the operator wishes to use it as universal, the jaws would be moved inwardly, so that the outer end would be perfectly even with the line on face; now engage the rack into gear with the pinions by sliding the spring washers outward, and the chuck is ready for universal work, and perfectly true. This chuck has a large hole in center, and will allow a drill or reamer to pass through work without injury.

The No. 1, or reverse jaw chuck, is used for holding drills, screws, pipes, etc., and is very convenient for this class of work, also for hand tool work, brass finishing, etc.

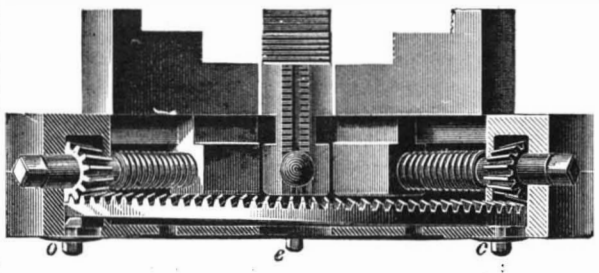


Fig. 2.—COMMON JAW.

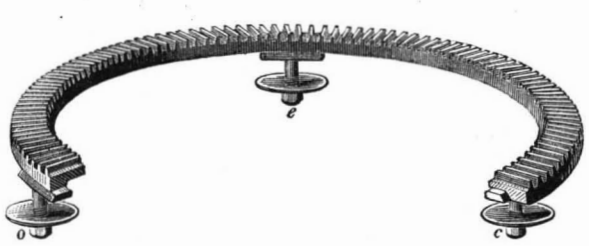


Fig. 3.—CIRCULAR RACK.

These chucks are furnished without the combination when desired, when they will be universal only. These chucks are made by Sweetland & Co., New Haven, Conn.

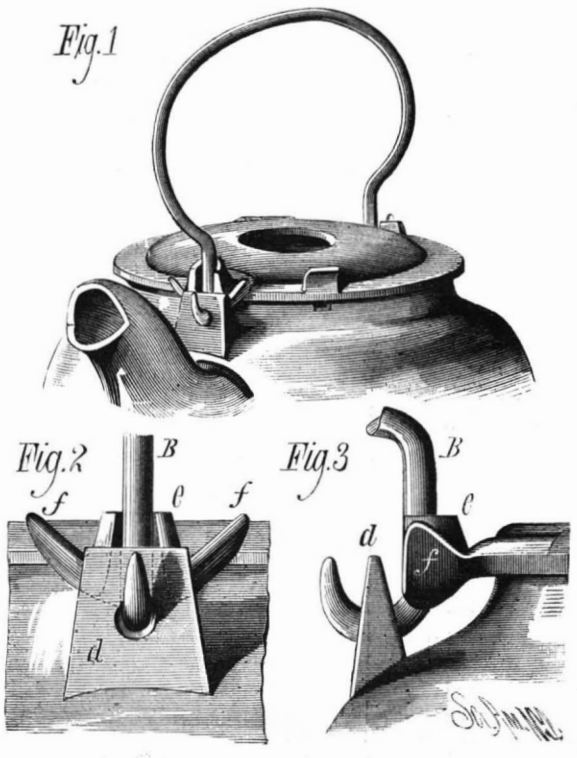
Good Living Easily Got.

In a recent communication to the San Francisco *Bulletin*, Mr. J. B. Rumford, of Bakersfield, Kern county, Cal., asserts that a man can earn enough there by fifteen days of "ordinary labor" to keep him in the best of food for a year. He says: "I find that three of us, a growing boy of seventeen years, my wife, and self, do not together use on an average more than one and one-half pounds of wheat or other grain per day, and though supplied with Seckel, Winter Nellis, and other pears, peaches, apples, Muscat grapes, and other fruit —not more than eight pounds of fruit per day—thus making a total expense of 2¼ cents for grain and 16 cents for fruit per day. So we have a total of 18¼ cents per day, or $66.60 per year, or $22.20 for each person; and as wages here for ordinary work are $1.50 per day (if you board yourself), it would take less than fifteen days' labor to provision each one a year on a full supply of the best grain and choicest fruits, giving the best health and gustatory pleasure; and as in the experiment we used them all uncooked, the only work of preparation necessary to be performed was a few minutes' time each day preparing the grain in a steel hand-mill, not equal to more than five minutes for each person."

Living in this way all the family gained in health. Mr. Rumford adds: "I was, in two weeks, completely cured of dyspepsia, that has troubled me from boyhood until nearly fifty years of age, and my spectacles, which had become constant companions, were nearly put aside, and with them all an increase of mental if not of physical ability. Any one, from one acre well cultivated in fruits and grain, with one hour's work each day, can be supplied with a most wholesome and delightful diet of the finest fruits and continue in good health; and one hour more, well applied, will furnish good comfortable clothing. Why need it longer be said man is subject to the curse of earning his bread by the sweat of his brow?"

IMPROVEMENT IN KETTLES.

The annexed engraving shows an improvement in kettles recently patented by Mr. L. A. White, of Attleborough, Mass. The design of the improvement is to keep the bail cool by holding it out of contact with the body of the vessel.



WHITE'S IMPROVED KETTLE.

To accomplish this the bail is hinged in the lugs, *d*, and at some distance from the hinge is bent outward in the usual way.

A latch or fork, *e*, is attached to the lid, and surrounding the lower end of the bail and holding it so as to retain the vertical position. The latch, *e*, is provided with two wings, *f f*, one on each side of the latch. When the bail is raised it will come in contact with these wings and raise the cover sufficiently to allow the bent portion of the bail to pass under the wings and enter the latch, *e*, when the cover will again descend and hold the bail in the vertical position.

A Bad Case of Globus.

Dr. Myers, of Paterson, N. J., was recently summoned in great haste, at midnight, to see a woman who was suffering the most excruciating agonies from having swallowed a set of false upper teeth, sixteen in number. Several women were about her, who had been called in to help her. Anodynes were administered to relieve her temporarily. Dr. Myers then closely scrutinized her mouth and throat, but could find no evidence of laceration. Moreover she could swallow readily. He suggested that the teeth might have been mislaid, but this was indignantly scouted by the attendants, who declared that they had searched the house from top to bottom.

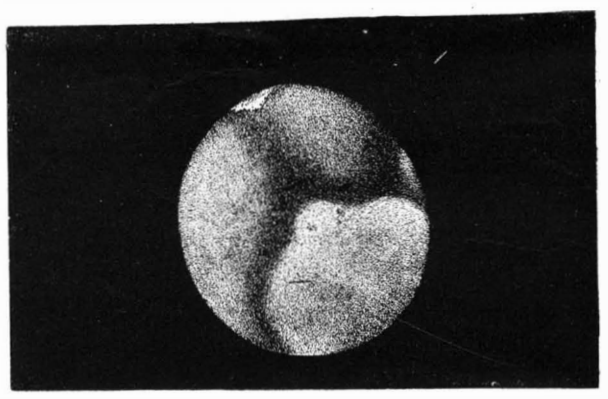
A further search under the pillow failed to disclose the missing property, and the case began to look serious, as the poor woman declared that she could not stand it any longer, as she felt the edge of the teeth cutting into the sides of her stomach. Finally, at the suggestion of the doctor, the inside of one of the pillow-cases was examined, and there the teeth were found, perfectly safe and harmless.

The patient, who had, a moment before, been suffering from the laceration of the teeth "against the edges of her stomach," recovered instantly, and the doctor was promptly dismissed.—*Medical Record.*

On the Probable Existence of Ocean Currents on Mars.

BY T. S. H. SHEARMEN.

The polar regions of Mars, like those of the earth, appear to be covered with a deposit of ice or snow. But there is a remarkable feature about the snow regions of Mars that has always puzzled astronomers. It is this: Their edges, instead of fading gradually as they should do if they melted by the direct action of the sun's rays alone, change in a



The planet Mars in its gibbous state, as seen on August 16, 1830, in the twenty-foot reflector at Slough, by Sir J. F. W. Herschel.

very sudden manner from snowy whiteness to an umbral blackness. The annexed sketch, taken many years ago, and when Mars was in a gibbous state, shows this appearance.

How shall we explain the absence of penumbræ to the Martial snow regions? After a thorough investigation, I venture to enunciate the theory that the phenomena mentioned are caused by the action of warm ocean currents, like our Gulf Stream, flowing from the equatorial regions of the planet. To my mind, no other rational explanation seems to offer.

Brantford, Canada.

Fireproof Paper and Printing.

BY L. FROBEEN, BERLIN.

Paper that is actually fireproof, *i. e.*, such as can endure a temperature of 800° C. (1,472° Fah.) in combination with writing ink or printer's ink, which would endure so high a temperature without being injured, has not yet been made. Some kinds of paper made with asbestos did, indeed, resist a temperature not too high, but it was not suitable for writing or printing. According to the German *Industrie Zeitung* a method has been invented for making paper, etc., having these fireproof properties.

Asbestos fiber of the best quality is washed in a solution of permanganate of potash and then bleached with sulphurous acid. Five parts of ground or finely divided wood fiber, such as is used for paper making, is mixed with ninety-five of the asbestos. The two are then mixed with glue water and borax in a Hollander, where they are very intimately mixed and worked over into a paper pulp, which yields a fine paper with smooth surface, and can be calendered for writing. It is claimed for this paper that it will resist a white heat.

For making a fireproof printing and writing ink a mixture of platinum chloride and oil of lavender is employed. Lampblack and varnish are added to give it a black color or for a writing ink the Chinese or India ink and gum arabic are added. Good results are obtained by the use of ten parts.

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of pure dry chloride of platinum, twenty-five of oil of lavender, and thirty of varnish. The chloride of platinum is warmed in a porcelain capsule until perfectly dry, the oil of lavender then added, and the mixture warmed until it ceases to give off any more gas. To the black tarry mass thus obtained is added lampblack and varnish in small portions. When paper printed with this ink is ignited the platinum salt is reduced to the metallic state and remains as a brownish-black coating.

A free-flowing ink for writing on fireproof paper with an ordinary metallic pen can be made from five parts of dry chloride of platinum, fifteen parts oil of lavender, fifteen parts of Chinese ink, one part of gum arabic, and sixty-four parts of water. The platinum imparts to the writing the property of appearing transparent on igniting, so that any writing or printing that has become black or otherwise illegible will easily become legible during the heating.

Fireproof colors can be made by mixing the commercial metallic colors used on porcelain with chloride of platinum and printer's or lithographer's varnish. An ordinary aquarelle pigment can be added to strengthen its covering power. The use of a mixture of dry chloride of platinum with printer's varnish here also furnishes the basis of gay colors which are fireproof. As an example the blue color is made of forty-five parts cobalt blue, fourteen parts aquarelle ultramarine, two parts of dry chloride of platinum, and thirty-nine parts of printer's varnish.

Fireproof aquarelle colors can be prepared in a similar manner for making designs and plane tables. For this use take sixty-eight parts of the mineral color, twenty-five parts of aquarelle pigment, two parts of dry chloride of platinum, and five parts of gum arabic, or other binding material soluble in water. In preparing fireproof aquarelle colors the metallic pigments are first elutriated and then boiled with the corresponding aquarelle colors; the boiling mixture is poured into a solution of the platinum salt, and the whole evaporated, after adding the gum or other soluble adhesive material, to dryness. The pigment thus obtained is employed in the same manner as the common water colors.

P. N.

A Trestle in Deep Water.

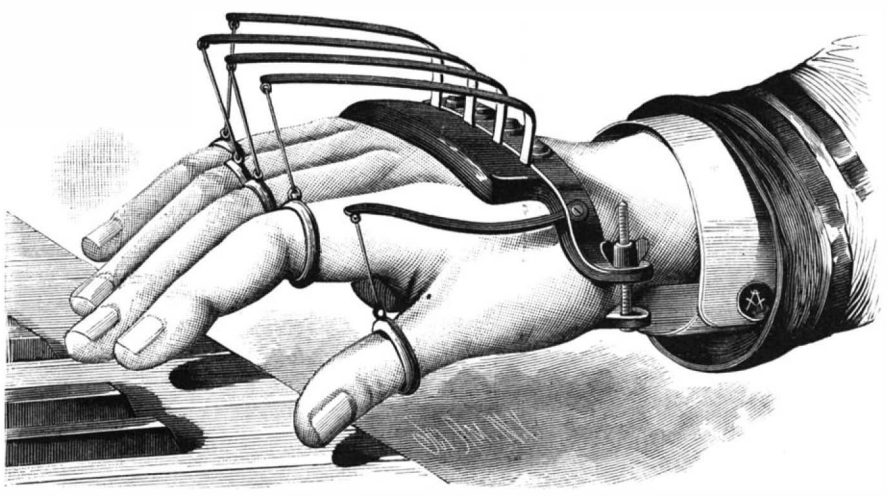
A notable piece of trestle work was completed near Warm Springs, N. C., December 16. It crosses the French Broad River at Deep Water, where the water is from forty to forty-five feet deep, and runs in the main channel with a current between four and five miles an hour. Many of the timbers of the trestle are over sixty feet long. The structure is intended for construction trains and for use in building a fine (single span) iron bridge two hundred and sixty feet long, for the W. N. C. R. R. Mr. J. M. Patton, who furnishes these particulars, expresses the belief that this trestle is in deeper and swifter water than any ever constructed before. Its successful execution is due to the skill and boldness of Captain John A. Ramsay, resident engineer, and Capt. Joseph E. Frey, builder. The work has been tested by trains heavily loaded with iron, drawn by a twenty-six ton engine.

FINGER-SUPPORTING AND EXERCISING DEVICE.

The engraving shows a device which will assist the pupil in efforts to hold the fingers in correct position according to the American or improved system of instruction, in which the hand and fingers are held horizontally as far as the second joint.

This improvement consists in an instrument capable of ready attachment to the hand, and having suspended from as many springs overhanging the fingers five rings, which, receiving the wearer's fingers, oppose a resistance to the muscular action in the act of playing, so as to compel the user to put forth unwonted strength with the result of imparting a superior decision of touch with greater flexibility and rapidity of motion, while the fingers as far as the second joint are supported from above in horizontal position.

This invention was recently patented by Mr. Benjamin Atkins, of Cincinnati, Ohio.



ATKINS' FINGER-SUPPORTING DEVICE.

A Forty Thousand Ton Blast.

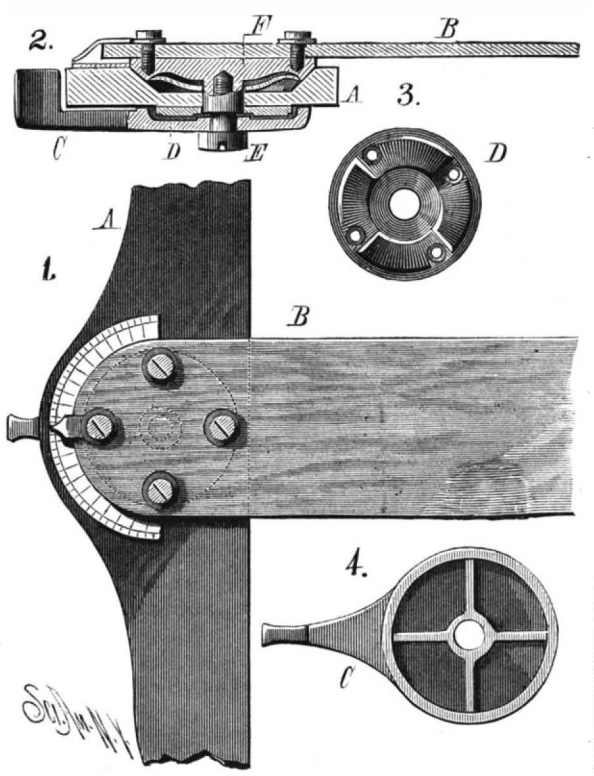
A great blast, which has been preparing for nearly a year at the limestone quarry of the Glendon Iron Company, near Easton, Pa., was fired recently, and forty thousand tons of rock were dislodged. Four tunnels, each fifty feet long, were run into the hillside, and at their end two chambers were built at right angles, each eight feet long. Ten tons of powder were used, and when the electric current was sent along the wire, the face of the rock, for a distance of 150 feet and a height of 25 feet, was blown out like a high wave, and the rock above this excavation sank into the space with a roar.

Cornstalks as Fuel.

An Iowa farmer, who has both coal and wood on his farm, warms his house with cornstalks, and claims that they make the best and cheapest fuel he can get. He uses a large stove, and burns the stalks in tightly-bound bundles, weighing about forty pounds each. A bundle burns three hours (without flame) in an air-tight stove. The large stove offers so much radiating surface that it does not need to be very hot. Five bundles a day, or 600 for the winter, suffice to keep the stove going and the room warm. The farmer, Mr. Ruggles, says: "I can bind up six hundred bundles of corn stalks in two days alone. I couldn't chop the wood to warm this room in a week. Then in the spring I have a load of strong ashes for my wheat field, while my neighbors have to cut up the same cornstalks in the spring to get them away from the harrow. It makes me smile when I hear about these idiots up in Minnesota who have fifty-acre cornfields, and still go cold or buy coal. Why, I'd rather burn cornstalks than cut maple wood within sight of the house."

IMPROVED T-SQUARE.

The engraving shows an improved T-square, the blade of which can be adjusted to any desired angle by a simple



HOERMANN'S T-SQUARE.

mechanism without the use of a clamping screw. The blade of the square is fitted by a conically-tapering pivot plate into a correspondingly tapering recess of the head, and tightly secured in position by means of a clamping lever plate, which engages by interior radial ribs, inclined cheeks of a plate secured to the under side of the head.

Fig. 1 is a plan view, Fig. 2 a transverse section, and Figs. 3 and 4 are views of the bottom plate of the head of the T-square and of the clamping lever plate respectively.

The blade, B, is pivoted to a central perforation of the head, A, by means of a pivot plate, which is secured to the under side of the blade. The circumference of the pivot plate is conically beveled and fitted into a correspondingly beveled recess in the head, A. To the under side of this head is secured a plate, D, having inclined cheeks, along which the interior radial ribs of a clamping lever plate, C, are moved when the plate is turned on the center pivot. The lever plate, C, turns loosely on the shank of the fastening screw, E, which is screwed into the pivot, a spiral or flat friction-spring being preferably interposed between the pivot plate and the recess of the head of the T-square for preventing any rattling. By turning the lever plate, C, in one direction its interior ribs move upon the inclines of the bottom plate, D, and draw the blade, B, into frictional contact with the conical recess of the head, so as to secure it tightly in any desired position. By moving the lever plate in the opposite direction the blade is released for adjustment on the head. In the better classes of T-squares a graduated scale may be arranged on the head, so as to set off any desired angle by means of a pointer secured to the end of the blade.

This invention was recently patented by Mr. Arnold Hoermann, of Hoboken, N. J.

RECENT INVENTIONS.

An improved trunk or valise, which can be increased or decreased in size as circumstances may require, has been patented by Mr. Franz Protzen, of Stargardt, Prussia, Germany. The invention consists of a valise or trunk constructed with stiffening frames, to the outer edges of which strips are pivoted which can be swung outward and locked in this position to form extensions of the frames and for stiffening the flexible or folding part of the covering of the valise or trunk, whereby the size of the trunk or valise can be decreased or increased by folding these pivoted strips inward or outward.

An improved meat hanger, patented by Mr. John Lawson White, of Wakefield, Va., consists in a rod provided with a straight part, having a pointed end and upwardly bent end pivoted at one end to the end of a hook adapted to lock with the straight pointed portion which receives the meat.

An improved device for stopping horses has been patented by Mr. Gumbersindo Villar, of Santander, Spain. This invention consists in the application of a device for closing the nostrils of the animal more or less when required, the device used being a curtain, fitted to be drawn down over the nostrils by a cord running parallel with the reins.

An improvement in oil stoves has been patented by Mr. Hubert S. Goffee, of Brockport, N. Y. The invention consists in combining two circular rotary plates with wick tubes arranged eccentrically therein. When it is desired to use the wicks at two different points—as, for instance, to heat two different vessels at a time—or when only one flame is needed, the disks are arranged so as to place the tubes of one disk at the greatest distance from those of the other. By rotating the disks in their seats the tubes of one disk are placed in close proximity to those of the other, so as to concentrate the flame from all the wicks at one point or under one vessel.

Mr. Cyrus R. Howard, of Huntingdon, Pa., has patented an improved draughting instrument which consists in the combination of a marking arm, a post carrying numerous figure plates, and an adjustable finger carried by the marking arm for engagement with either figure plate.

An improvement in fences has been patented by Mr. Rivers Donaldson, of Tiptonville, Tenn. In constructing this improved fence short posts are set in the ground, and to the opposite sides of their upper ends are bolted the lower ends of two uprights. Fence panels are then placed upon the upper ends of the short posts with their overlapped ends between the uprights and secured in place by bolts passing through their corner and the upper ends of the said uprights. To the upper ends of the short posts is secured a barbed wire to fill the space between the lower edge of the panels and the ground.

Chewing Gum.

Forty thousand dollars' worth of chewing gum is gathered in the State of Maine every year. In Oxford county is a man who makes it his business to collect spruce gum. Every year he buys from seven to nine tons. The gum is found chiefly in the region about Umbagog Lake and about the Rangely lakes. A number of men do nothing else in the winter season except collect gum. With snowshoes, ax, and a sheboygan, on which is packed the gum, they spend days and nights in the woods. The clear, pure lumps of gum are sold in their native state, the best bringing one dollar per pound. Gum not immediately merchantable is refined by a peculiar process. Sieve-like boxes are covered with spruce boughs, on which is placed the gum. Steam s introduced underneath. The gum is melted, s strained by the boughs, and then passes into warm water, where it is kept from hardening until the packer takes it out, draws it into sticks, and wraps it in tissue paper, when it is ready for market.

The gum meets with a ready sale. There s not a village, town, or city in Maine where t is not in demand. One dealer last year sold fourteen hundred dollars' worth. In the large mill cities gum has a free sale. In Biddeford, Lewiston, Lawrence, and Lowell, the factory girls consume large quantities. It is said that in the lumber camps gum is used as a means of extending hospitality. After meal time the host fills his own black clay pipe, and hands it to his guest. Later, clear lumps of spruce gum are placed before the visitor, and he is asked to take a chew. Maine produces forty thousand dollars' worth of gum in a year, some of which finds its way to this market, from which it is distributed to the various outlying factory villages, where, as stated before, it is in good demand. Spruce gum is adulterated, and those who adulterate take the trouble to fashion the pieces of gum to appear like those taken in a pure state from the trees. The ingredient of adulteration is supposed to be the gum of the pine tree.—*Providence Journal.*

New Tablet.

The Albany (N. Y.) Perforated Wrapping Paper Company are making a new article of stationery, consisting of a writing tablet to which is attached a roll case containing a roll of paper, which is drawn out upon the face of the tablet ready for use as fast as wanted.

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A Patent Fertilizer which Anybody May Use.

In December last the United States Circuit Court, Baltimore, in the case of Boykin and Carmen against R. J. Baker & Co., which was argued before the court several weeks ago, Judge Morris filed his opinion in favor of the defendants. The action was for alleged infringement of a patent for the manufacture of fertilizers held by the complainants, from the manufacture and sale of which they would have derived large profits, had not the defendants and others infringed upon their patent. The court held that the only difference between the formula patented by complainants from the old Liebig formula was the substitution of dissolved bone and ground plaster for ground bone and calcined plaster, and that the patent was invalid for want of novelty or any patentable discovery. A large interest was involved in the result of this suit.

The patent in question is No. 206,077, dated July 16, 1878, and it describes the making of the fertilizer as follows:

This invention relates to a combination of chemicals to be used in connection with dry peat or muck and unleached ashes, or with any refuse matter having fertilizing properties, to form a fertilizing compound; and it consists in combining dissolved bone, ground plaster, nitrate of soda, sulphate of soda, and sulphate of ammonia, in proportions substantially as follows:

Dissolved bone, three bushels; ground plaster, three bushels; nitrate of soda, forty pounds, sulphate of soda, forty pounds; and sulphate of ammonia, thirty-three pounds. This mixture is incorporated with, say, twenty bushels of dry peat or muck, and three bushels of unleached ashes.

The manner of preparing a fertilizing compound from the above ingredients is as follows: The peat or muck and ashes, if such matter is used as the base of the mixture, are first thoroughly mixed with the dissolved bone, and the nitrate of soda, sulphate of soda, and sulphate of ammonia, after being dissolved in water, added thereto. The ingredients are next incorporated with the ground plaster, after which the compound is allowed to stand for, say, thirty or forty days, when it becomes ready for use.

NEW INVENTIONS.

An improvement in violins has been patented by Mr. Phineas Topham, of Newark, N. J. The object of this invention is to increase the volume of sound and the fullness of the notes of the violin, to facilitate the playing of two notes at once, and to enable the operator to play the accompaniment with the tune. The invention consists of a violin provided with a sounding board extending over and supported on the violin belly, with its tongue engaged in a pocket of the finger board, of a number of auxiliary strings stretched between the usual strings, of a swinging link pivoted in the scroll for the attachment of the auxiliary strings, of a tail piece for holding the usual strings, and provided with tightening pins for holding and setting the auxiliary strings, and of the bridges set on the sounding board to support the strings.

Mr. John F. Petri, of Midland Park, N. J., has patented a coupling for telegraph or other wires, by means of which wires can be joined more expeditiously and with less labor and expenditure of force than by the usual method of twisting them about each other. The invention consists in coupling the wires by means of a semi-cylindrical metallic plate having two radial holes to receive the bent ends of the wires. The wires having their ends bent at right angles are laid in the plate with their ends entered into the holes therein, and the said plate is then, by means of a hand vise or other suitable tool, clasped tightly about the wires, so as to form a closed sleeve about the point of union.

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Mr. Juan F. N. Macay, of Charapoto, Ecuador, has patented an improved filter. This invention relates to improved apparatus for use in effecting the operations of dissolving solids in liquids and producing chemical reactions, and of filtering or separating liquids from solids in chemical and metallurgical processes, in which a soluble substance or substances, mixed or combined with an insoluble substance or substances, is or are to be dissolved separately or together, wholly or partially, in a given solvent or solvents, and the solution separated by filtration from the undissolved residue. The invention consists principally of a rotary decanting filter, which is composed of an outer barrel or cylinder and an inner perforated shell covered with filtering material, the intervening space being divided into segmental compartments provided with a draw-off cock for running off the liquid when separated by filtration. The outer cylinder of this rotary filter is provided with end angle-iron hoops arranged to run in grooved rollers mounted in a suitable frame or cradle. Either one or both of the heads of the cask are made removable to give access to the interior of the filter. The inner cylinder is made up of grooved and perforated staves for operation in combination with a filtering cloth applied to said cylinder. Besides these there are numerous other peculiarities of construction which assist in producing a filter, for the purposes named, that shall keep its filtering surface free from being clogged by particles of solid matter, and that shall present a clear and unobstructed filtering surface for effecting the rapid separation of the liquid from the solid matters.

Mr. Daniel L. Lamson, of Fryeburg, Me., has patented an improved heater, which, without being expensive, is very convenient. The object of this invention is to construct a heater for burning coal or wood, or both together, whereby advantage may be taken of the cost or convenience of the fuel supply, and the fire be better adapted to the condition of the weather. Said heater consists principally of a lower coal burning fire-pot chamber, and an upper wood burning chamber, with a radiating space between them to permit free radiation from the top of the one and the bottom of the other. The main smoke flues are arranged in the form of a cross, centrally intersecting each other above the wood-burning chamber, and connecting respectively by side flues and branches with the two chambers. Valves or dampers serve to control the draught from either chamber independently of the other. The combination of these two fire-chambers for burning different kinds of fuel in the one structure is a convenient one, thus a quick heat may be obtained from the wood burning chamber, while a slower but more lasting one is progressing in the other chamber.

Mr. John Murphy, of Auburn, N. Y., has patented an improved carding machine. This invention is designed to be applied to what is known as the "finisher" carding engine which receives the material in the form of drawings from the "second breaker." The object of the invention is to avoid that inconvenience and waste of stock which has heretofore been occasioned by the uneven and lumpy nature of the outer threads of roving as they come from the outer rings of the doffer cylinders of the finisher. To accomplish this the uneven stock, be it either cotton or wool, is taken from the outer edges of the main cylinder of the "finisher" by card-clothed rings on the ends of a third doffer or worker, and is passed to a pair of rolls over which is a vibrating roller, where each strand is partially felted together. From thence each strand passes under a guide finger to a twister-tube, where the two strands are twisted together. From the twister-tube the now single strand passes through carrying rolls to a carrier pulley, from whence it is caused to pass and unite again with the drawing to be refed to the feed table of the carding engine, thus causing the fed stock to be more even than if composed of the single drawing feed alone.

Improvements in that class of cotton sweeps or shovel plows in which a guide plate extending into the soil deeper than the point of the plow is arranged in rear of it, has been patented by Mr. John Brandy, of Lillington, N. C. The plow standard has plates pivoted thereto with a recessed plate secured between them. The guide projecting into the soil below the point of the sweep steadies the latter and prevents any lateral movement of the sweep.

An improvement has been made in flaxseed cleaners, which is also applicable to other seed or grain cleaners. The improvement is the subject of a patent granted to Mr. George Beal, of Gilman, Iowa, and consists in operating the screen of the apparatus by means of a bell crank lever, having its axis arranged transversely to the screen, and which is actuated by a rotating wiper wheel, the axis of which is transverse to that of the lever, whereby the screen has a sudden and rapid lateral as well as a quick and jerking longitudinal movement given to it. This effects a very thorough cleaning. Special means are provided for preventing undue lateral movement of the lever and for keeping it in contact with the wheel.

Mr. John W. Baker, of Hardin County, Tenn., has patented an improved baling press for baling cotton, hay, and other materials with facility and dispatch. The press which forms the subject of this improvement has the sides of its baling box extended upward to form guides for the follower, which is provided with upward extensions to work therein. The head block is attached to the sills of the frame, and has combined with it and the frame removable side planks secured by tie bars for removing the compressed bale. Power is applied to the follower to depress it by means of levers pivoted at their lower ends to the follower, and jointed at their upper ends to the upper ends of two other levers on opposite sides of the press, and which are pivoted below to the main frame. An upper central winding shaft, worked by a draw rope, has secured to it the opposite ends of a rope which passes around pulleys connected with the upper ends of the side levers for drawing the latter toward each other to give the necessary compressing action to the follower, which may afterwards be raised by a separate rope and pulley attachment. With this construction the follower is forced down with great power, but may be quickly raised.

An improvement in the class of grain separators which include a traveling endless band elevator and a "shaker," or means for separating the oats from the straw and conveying the latter away from the machine, while the grain passes downward and is winnowed by a fan blast, has been patented by Mr. William H. Janney, of Martinsburg, W. Va. The improvement relates to the construction and arrangement of the parts by which the course of the falling grain and blast is directed, so that the grain is more thoroughly cleaned, and without the aid of vibrating or other screens.

An improvement in nippers for operating upon hogs, to prevent them from rooting, has been patented by Mr. William B. Lyon, of Pontiac, Ill. The invention consists in a pair of nippers provided with a hook at the end of one jaw, which is elongated for the purpose of drawing out the tendon, and with a knife on the other jaw for cutting the tendon and splitting the hog's rooter. This device is simple in its construction and certain and effective in its operation, and does its work with but little pain to the animal.

Cameos.

The art of cutting stones, comprising the lapidary's art, owes its origin to the innate superstition that precious stones hung about the neck were a protection against evil spirits and witches. Beside the brilliant and transparent noble stones or gems, like the diamond, ruby, emerald, sapphire, topaz, amethyst, which were more rarely employed, the translucent and opaque or soapy-looking stones which take a fine polish were mostly employed. Among the latter are the opal, turquois, and agate, or common rocks like granite, syenite, and basalt; or those of animal origin, such as ivory, coral, mother-of-pearl, and amber, as well as metals. These were variously ornamented by different kinds of cutting. By deep cutting bold relief pictures were formed; by slight cutting, the bass-relief. The latter are called cameo. The Greeks, who received the art of cutting stones from the East, did some excellent work; they decorated many utensils and vessels with cameos, and in fact cut out whole vessels of great beauty and of technical perfection. This is seen in the so-called Portland Vase in the British Museum. The old Romans, too, who learned this art from the Greeks, are distinguished for excellence in it. In the early centuries of the Christian era this art was cultivated in Constantinople especially, while it seems to have been but little known in the West. In the fifteenth century it was brought to Italy by Grecian workmen from Constantinople. It was cultivated there up to the time of the Renaissance in the sixteenth century, particularly in Florence. The fabrication of vessels and articles of splendor from rare stones, which had also been done in Greece, was renewed here in the finest manner.

The cabinet of gems in Paris and Florence, the imperial treasury at Vienna, the treasure chamber in Munich, and especially the Green Vaults in Dresden, all possess a large number of such works of art from the hands of Italian, French, and German artists. In the seventeeth century during the Thirty Years' War, when all art was crippled and retarded, the art of cutting stones also declined, and with the exception of a short revival in the eighteenth century, not much has been accomplished since.

At the present time the manufacture of cameos is carried on chiefly in Genoa and Rome, as well as in Paris, as a branch of industrial art. According to the *Techniker*, cameo cutting was exclusively confined to Italy and Rome forty years ago, but now Genoa has about thirty persons engaged in this art, Rome eighty, and Paris over three hundred.

The cameo cutters of to-day employ not only precious stones, but shells, lava, etc. Certain species of univalvular mussels are especially suited for cameos, because they consist of several layers of different colored material, which also vary in hardness and texture. These shells are worked in such a manner that the direction of the leaves of the middle layer runs lengthwise. In these cameos the middle layer forms the body or the relief, and the inner layer the back ground, and the external differently colored layer on the surface gives to the figure a different appearance or a special setting. In selecting shells with three strata, the artist selects one where the layers adhere together well, the middle one being quite thick, and the three different in color, while the inner one is of such a shade as suits the intended work.

The shells are first cut into pieces of suitable size by means of a slitting tool and diamond dust, or a steel knife supplied with emery and water. These pieces are fastened on a four-sided, oval, or other shaped stone, and the edges polished with an oil stone. They are then cemented on a piece of wood to serve sa a handle to hold the cameo while he draws upon it the figure that is to be cut in it. The marks of the pencil are now followed with a sharp pointed instrument which cuts the required outlines. Then finer tools of steel, wire hardened and polished on the end, files, and engraver's chisels are employed to remove the superfluous parts of the white enamel. The surface of the cameo, so far as possible, is finished with cutting tools, because the sharp edges of the figures would be injured by polishing. After the figure is cut in relief, a final polish is given, using a little putty powder dry on a stiff brush. In this operation great care must be taken not to scratch the surface. The cameo is then removed from its wooden handle, and is ready for sale. The pink conch shells make a very delicately shaded cameo that is highly prized for brooches and cuff buttons.

P. N.

Cider--Its Purification and Preservation.

Of the cider mill nothing more need be said than that the little crusher of our daddies is being replaced by the modern power press capable of pressing one thousand bushels of apples in ten hours. As to the best method of caring for and refining cider, no better rule perhaps can be adopted than running it directly into tanks from the press through a sufficient number of strainers to detach all the pomace possible; then after fermentation has gone nearly far enough to run on the leaches, rack it off. By this process a purer article can be obtained, which will run through the leaches with less waste and far less liability to clog up. There is no particular scientific test necessary to determine just what stage of fermentation is necessary before racking off. Experts claim that experience has taught them to let the cider ferment in the tanks to 18°, but not lower. It is always best to ferment as much as possible while still retaining sufficient sweetness in the flavor. In racking off, it will ferment a little and is in good condition to be put on the leaches at 15°, which is perhaps the best test for that process, although a tank filled with cider which may have been run to 19°, or even as high as 25° of the saccharometer, will run off generally at a uniform test of about 22°, not varying perhaps more than 2° in the test of different tanks. It has been asserted that cider will keep better run down to 15°.

In making leaches pine lumber is doubtless best, and certainly wood in preference to metal. The sand can be set from four to six inches, according to the season, the lighter leach being best for warm weather and the heavier for cold. No leach should stand over two settings, as it is not probable that clear cider can be obtained after a second skimming. Of course skimming is understood to mean scraping off the sediment from the sand which gradually forms on the top, which causes the cider to run slowly. After this, when the cider ceases to filter through in good condition the sand must be thrown away and new setting made. Cider seldom runs through with as good results after the skimming as before, and especial care must be taken not to disturb the sand below.

As to size and capacity of leach, one three feet by twelve feet and fourteen inches deep, with four to six inches of sand, will run through twenty casks of cider without change of sand. Much question has arisen as to the possibility of thoroughly cleaning and renewing the sand for further use, but it is probable that the best way to renew it is to get a new car load. For all convenient localities Massachusetts sand is perhaps the only sand that should be used, as it contains some mineral element that refines cider in a superior manner to other sand.

In leaching much depends on the dampness or dryness of the sand, as to how much cider should be run on when first started. A medium grade of cotton factory cloth is about as good as any other kind for use on the leach, with, say, a foot or two square of rubber cloth resting on an overlay of burlap for the cider to strike on, as a very little ripple in the cider is liable to crack the sand. A new way of cleaning these cloths has been introduced by hanging them up to dry and then whipping out the pomace like dust from a carpet; hot water, it is asserted, cooks the cider into the cloths like apple sauce, while some prominent cider-makers have noticed a foam on cloths cleaned with water after the juice had again started through, which begins to ferment when the cider comes in contact with it, although it is probable that foam will form on any cloth at certain times, which may not be any indication of fermentation. Steam will probably destroy the germ of fermentation as well as anything else, whether in clothes-racks or barrels.

As to cleaning racks, lime has been used with good results, where steam or abundant rinsing with water is afterward employed. A hose and a good broom are often all that is needed for the purpose.

The old process of refining by sounds or isinglass is being discontinued in favor of sand, therefore we do not give space to any suggestions as to that mode of treating cider.

In the matter of keeping cider, all that is to be kept for any length of time through hot weather should be racked off in the spring, as it is subject to a second fermentation sometimes, and then a cool cellar without ice is preferable. Good whisky barrels are best for putting up cider, which can always be improved by an additional racking before moving it from the cellar. The old treatment by putting in mustard seed, raw beef, and similar primitive substances of our grandfathers has pretty generally given place to the preservative qualities of salicylic acid.

These improvements in making, refining, and keeping cider have brought it up to such an excellent standard as a beverage that our bottlers are turning their attention to it as a winter industry, and they are now extensively supplying it as an excellent aerated bottled beverage, generally under the name of champagne cider, and greatly improving its pleasant and healthful properties by the sparkling effervescence of carbonic acid gas.—*American Bottler.*

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Business and Personal.

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Patent Wanted.—I want to buy whole or part interest, or manufacture on royalty. Address H. C. Lyon, New York.

Lehigh Valley Emery Wheels, made at Lehighton, Pa., are free cutting, durable, and reliable. Every wheel guaranteed to do the work it is ordered for. See adv. on page 450.

For Machinists and Apprentices.—The Student's Illustrated Guide to Practical Draughting. Sent on receipt of $1. T. P. Pemberton, 142 Greenwich St. P.O. Box 3083, N.Y.

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Send for Pamphlet of Compilation of Tests of Turbine Water Wheels. Barber, Keiser & Co., Allentown, Pa.

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Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H.

The Sweetland Chuck. See illus. adv., p. 450.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Cope & Maxwell M'f'g Co.'s Pump adv., page 398.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Skinner's Chuck. Universal, and Eccentric. See p. 449.

Punching Presses & Shears for Metal-workers, Power Drill Presses, all sizes. Power and Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

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Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

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Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

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Learn Telegraphy. Outfit complete, $4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. [p. 413.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 413.

For Leather, Rubber, or Cotton Belting, Linen Hose or Rubber Hose, write Greene, Tweed & Co., N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 412.

Safety Boilers. See Harrison Boiler Works adv., p. 412.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 449.

Draughtsman's Sensitive Paper. T. H. McCollin, Phila., Pa.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S. C. Forsaith & Co., Manchester, N.H., and N.Y. city.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

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Centrifugal Pumps, 100 to 35,000 gals. per min. See p. 13.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N.J

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 14.

Metallic Letters and Figures to put on Foundry Patterns, all sizes. H. W. Knight, Seneca Falls, N. Y.

Eagle Anvils, 10 cents per pound. Fully warranted.

Peerless Colors for Mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 13.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

The Medart Pat. Wrought Rim Pulley. See adv., p. 14.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 14.

See Bentel, Margedant & Co.'s adv., page 14.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 12.

The Twin Rotary Pump. See adv., p. 413.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 13.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phila. P.

Telegraph, Telephone, Elec. Light Supplies. See p. 13.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

4 to 40 H. P. Steam Engines. See adv. p. 382.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 13. Totten & Co., Pittsburg.

Portable Power Drills. See Stow Shaft adv., p. 13.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc. for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) A. A. E. asks: Can you tell us how so-called "photo-stereotypes" are prepared? A. A sheet of ordinary plate glass larger than the picture to be reproduced is coated in the dark room with a solution made by dissolving one ounce of potassium bichromate in fifteen ounces of water, warming gradually, then adding two ounces of fine gelatine, and filtering through linen at the boiling heat. A diapositive is taken from an ordinary negative, and laid with the collodion side to the gelatine face of the prepared plate in diffused light for from ten to thirty minutes. The plate is then washed with water in the dark room for five to ten minutes, till the relief is fully developed. The plate is then dried with filter paper, and coated with glycerine by means of a camel-hair pencil and the excess of liquid removed with filter paper. From this plate a cast is made in plaster of Paris of the consistency of oil, and from this plaster cast a metal stereotype copy is taken in the usual way. See Stereotypy, in SUPPLEMENT, No. 310.

(2) L. N. P. writes: I have been experimenting in making paper matrices for stereotype plates according to your directions in answer to O. T. M., and have succeeded in making very good matrices, but I have not been so successful in casting the plates from these—the melted metal refusing to run into and properly fill some parts of the matrix. Can you give us directions that will enable us to cast the plates as well as make the paper matrices? A. You will find practical directions for casting stereotype plates in SUPPLEMENT, No. 310.

(3) H. S. P. asks: 1. Can a kerosene oil stove, burning the best oil, be used in a study room, for any length of time, without serious injury to the health of the occupant? The stove is movable and not connected with any flue. A. Unless adequate provision is made for the escape of the products of combustion from the room as rapidly as formed, the atmosphere of the room soon becomes seriously polluted thereby. A. Can you suggest any way of obviating the difficulty? For example: Would it be possible to purify the air as it leaves the stove by passing it through some liquid? A. We know of no practical way of obviating the difficulty by chemical means. If the room contains a window a suitable flue is easily constructed.

(4) T. M. D. writes: Please give me a rule by which I can find the capacity of pipes or tubes. A. To ascertain the contents of a pipe multiply the square of its diameter in inches by 0·7856, and the product by the length of the pipe, in inches. This divided by 231 (cubic inches in a gallon), gives the contents of pipe in standard gallons. 2. How many gallons in a pipe 5,000 feet long and 1½ inches in diameter? A. About 38·1 gallons.

(5) A. D. L. asks: 1. Can you tell me of any cheap method of treating cloth, by a coating or otherwise, which will render it proof against the action of strong sulphuric acid? A. We know of no preparation that will answer your requirements. 2. How is rubber tubing made? A. See page 3993, SUPPLEMENT, No. 257. 3. Can vulcanized rubber be melted or liquefied? If so, how? A. Vulcanized rubber cannot be melted or dissolved without destroying its properties.

(6) H. E. writes: I see in your SCIENTIFIC AMERICAN, on page 297, No. 19, in an article entitled Nickel Plating, this: "A bath of pure granulated tin, tartar, and water." I would like to ask what it is and how made? A. Cream of tartar is dissolved in hot water, to make a strong solution, and granulated tin and nickel put into this and boiled in the liquid.

(7) J. B. G. asks: If you take from the finest cast steel all the carbon, is the quality of the metal (steel) improved thereby or otherwise? A. When the carbon is entirely removed from ordinary steel it becomes soft iron.

(8) F. W. K. asks: 1. Will a log travel faster than the current in which it floats? Will a log travel faster than a ship? A. Under ordinary conditions, no. 2. Is the gas of a blacksmith's fire injurious to a man's health? A. Yes.

(9) R. H. J. writes: I have a quantity of sheet zinc, the surface of which I wish to stain or color a solid black. Can you tell me how this may be economically done? A. First scour the metal with fine quartz sand moistened with dilute muriatic acid, and after rinsing quickly put the sheets into a solution of equal parts potassium chlorate and oil of vitriol. A. slight velvety black deposit is immediately formed. Rinse the plates and let them dry; then plunge them into a thin varnish composed of asphaltum dissolved in benzine, drain, and rub with a cotton rag.

(10) R. V. J. asks: 1. Is excluding the air and a cool temperature all that is necessary to preserve eggs? A. See "How to Preserve Eggs," page 3, vol. xlv. 2. Is there any paper compact enough to keep air from passing through it? A. No; but paper can be rendered "airproof" by means of varnishes. 3. Is tin the cheapest material that air will not pass through? A. It would not be difficult to find an "airproof" substance cheaper than tin. 4. Will relief from a portion of atmospheric pressure exclude the air sufficient to preserve organic substances from decay? A. No; decay or putrefaction is due to the presence of putrescible germs found in all organic substances exposed to the atmosphere rather than to the action of the air. 5. Is confined air a non-conductor of heat? A. No; but it is an exceptionally poor conductor of heat.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

R. J. McD.—Impure barium sulphate—heavy spar—chiefly used for adulterating white paints.—C. H. E.—The scale is composed chiefly of lime carbonate. The water may be safely used for potable purposes.—M. G. S.—It is a fair bituminous coal, but contains a large per cent of ash.—J. R. E.—An argillaceous hematite iron ore containing mica.—C. W.—Clay iron stone—an impure iron ore.—W. E. H.—Limestone and quartzite—contains no metals of value.—H. C.—A talcose slate rock containing much iron sulphide.—R. E. P.—An argillaceous limestone—some of this stone might make a good cement.—B. G. N.—No. 1. Red jasper—a variety of quartz; 2 and 3, flint; 4, lime carbonate; 5, and 7, limonite—iron oxide; 6, limestone.—W. H. B.—Partially decomposed feldspathic rock.—H. B. N.—Sandstone.—D. W.—Pyrites—iron sulphide—in limestone rock.—I. B. S.—Ferruginous quartz—contains a little hornblende and mica.—M. S. M.—Fluorspar—calcium fluoride. Used as a flux in some metallurgical operations and by potters. Its powder exhibits strong phosphorescence when heated in the dark.—T. S. S.—Composed chiefly of sulphur and manganese oxide.—A. B. H.—An analysis would be necessary to determine the composition of the preparation.—J. W. S.—It is powdered talc.

COMMUNICATION RECEIVED.

On the Lungs. By T. H. and W. S.

NEW BOOKS AND PUBLICATIONS.

ROCKLAND CEMETERY. By William Wales. Illustrated. 16mo, pp. 157. New York: A. D. F. Randolph & Co.

While aiming to present the advantages of the new and beautiful park cemetery at the head of the Palisades of the Hudson, to those who desire an attractive resting place for their dead, this volume offers an agreeable variation from the customary literature of the cemetery, in a number of bright and hopeful chapters embracing many choice selections in prose and poetry relative to the "final inevitable." The book is handsomely printed and illustrated by a score of views in the cemetery and up and down the Hudson from its several plateaus.

GOLD, SILBER, UND EDELSTEINE (GOLD, SILVER, AND PRECIOUS STONES). By Alexander Wagner. 260 p. Wien. Pest. Leipzig: A. Hartleben. 1881.

This work contains carefully prepared treatises on gold and silver, their hemical properties and combination, alloys, and the manner of preparing them, and the art of casting, soldering, cleaning, and polishing gold and silver both by the chemical and mechanical processes. The ornamentation by means of niello and enamel is carefully described, as well as the manufacture of plated ware, and gold and silver plating, by means of a battery or the fire process. A brief description of the precious stones, pearls, corals, and imitation stones, completes this interesting publication, which will be found to be of very great service to the jeweler and gold and silver smith, as all the results, formulæ, etc., given are based on practical experience.

MARBLE AND GRANITE WORKER'S GUIDE. Compiled by Frank M. Nichols. Chicago: Nichols & Co. Quarto, pp. 192. Price $6.

The compiler has brought together a number of practical papers and a large number of recipes bearing upon the stonecutter's art, with special reference to gravestone and monumental work. The instructions given would appear to be in the main sound and useful, though not always skillfully put or well edited.

English Patents Issued to Americans.

From December 1 to December 13, 1881, inclusive.

Bricks, tiles, etc., E. L. Ransome, San Francisco, Cal.
Car trucks, etc., J. N. Smith, New York.
Cloaks and dresses. I. Lojca, New York city.
Electric light, J. S. Williams, Riverton, N. J.
Electric light, J. S. Williams, Riverton, N. J.
Electrical conductors, covering, H. S. Maxim, Brooklyn, N. Y.
Grain grinders, W. D. Gray, Milwaukee, Wis.
Looms, W. Talbot, Philadelphia, Pa.
Nail machines, J. Cayne, Pittsburg, Pa.
Nippers, T. O. Hall, Brooklyn, N. Y.
Ornamented fabrics, Fabric Ornamenting and Manufacturing Company, New York city.
Ornamental glass, Budd & Grant, Boston, Mass.
Railway signals, W. S. Shaffer, Philadelphia, Pa.
Rice, etc., cleaning, F. Brotherhood, Charleston, S. C.
Rubber boots and shoes, F. Richardson, Providence, R. I.
Steam generators, S. W. & N. W. Pratt & Co., Brooklyn, N. Y.
Screws, American Screw Company, Providence, R. I.
Telephone Transmitters, E. H. Johnson, New York.
Window glass, securing, T. Tanner, Osage, Neb.
Curing meat, fish, etc., A. Fowler, New York city.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

December 13, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Agricultural implement, J. L. McCall 250,826
Amalgamator, ore, R. R. Waitz 251,008
Annealing furnace, F. Baldt 250,702
Auger, earth, L. A. Blake 250,778
Bag holder, G. Van Dyke 250,855
Baling press, P. K. Dederick 250,894, 250,895
Baling press, B. J. Wilson 250,699
Bar. See Sewing machine needle bar.
Bath. See Shower bath.
Bearing, anti-friction, T. R. Ferrall 250,721, 250,903
Bed bottom, spring, Hood & Christmas 250,814
Bed lounge, sofa, A. Hentschel 250,810
Bellows, D. C. Thompson 251,000
Belting, machine and process for manufacturing machine, M. Gandy 250,800
Bicycle, E. C. F. Otto 250,960
Bicycle head blanks, die for forging, H. T. Russell 250,981
Bicycle lantern holder, Jackson & Frisbie 250,737
Bicycle neck and spindle blanks, die for forging, H. T. Russell 250,980
Bicycle steering head, H. B. Hicks 250,917
Bicycle wheel fellies, die for joining, H. T. Russell 250,982
Billiard cue, Williams & Rundle 250,861
Bit and drill stock, W. Lyon 250,670
Boat and method of constructing the same, E. G. Durant 250,717
Boiler. See Steam boiler. Water tube circulating boiler.
Boiler furnace, G. E. Buschick 250,882
Bolt. See Flour bolt.
Boot and shoe heels, machine for attaching, E. Fisher 250,654
Boot and shoe strap, J. A. Thompson 250,766
Boot heel, F. Richardson 250,975
Boot jack, Gardner & Nichols 250,655
Boot or shoe, C. Grant, Jr. 250,909
Bottle, siphon, A. Fischer 250,653
Box. See Cheese or lunch box. Cotton gin roll box. Toy money box.
Box, barrel, or crate, W. Crowell 250,890
Brake. See Car brake.
Bran dresser, C. De Haven 250,791
Bridge, J. H. Ibel 250,921
Bridle, A. Hosack 250,920
Brush, tooth, J. K. Griffin 250,658
Burner. See Gas burner. Hay and straw burner. Hydrocarbon burner. Lamp burner.
Button, R. S. Cutting 250,891
Button hole cutter, M. T. Lotz 250,669
Button or stud, Cooke & Spencer, Jr. 250,713
Buttons and studs, fastening for sleeve, M. P. Bowman (r) 9,973
Calendar, clock, J. K. Seem 250,682
Cane for the grinding mill, windrowing and preparing sugar, W. Littlejohn 250,741
Cane, method of and apparatus for treating sugar, P. Faure 250,720
Car brake, C. W. Lanpher 250,822
Car brake, B. L. Stowe 250,852
Car brake and starter, E. W. Poston 250,751
Car brake, automatic, J. T. Skelley 250,984
Car brake, vacuum, C. W. Lanpher 250,823
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Car coupling, W. L. Davis 250,898

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Car coupling, R. Forward.... 250,905
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Carpet and oil cloth fastener, J. Latcher.... 250,927
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Carriage circle iron, Howe & Gallup.... 250,663
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Caster, furniture, W. Hessman.... 250,812
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Cock and casing, service, J. Broughton.... 250,780
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Coffee, etc., machine for treating, G. W. Hungerford.... 250,818
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Coffee mill, R. L. Webb.... 251,011
Coffee pot, J. L. Fusner.... 250,798
Collar, R. S. Norton.... 250,953
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Compost, H. S. Bradley.... 250,706
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Cotton press, W. J. Clarkson.... 250,711
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Cultivator, Capehart & Stewart.... 250,782
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Dredging machine, Brown & Bell.... 250,877
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Dust collector, N. W. Holt.... 250,813
Earth boring apparatus, J. R. Davis.... 250,651
Egg case, Neefus, Jr., & Miller.... 250,674
Egg preserving apparatus, D. Smith.... 250,985
Electric call transmitter, L. S. White.... 250,859
Electric gate, automatic, F. W. Watson.... 251,009
Electrical conductor for oil tank protection, W. P. Newhall.... 250,950
Engine. See Carding engine. Rotary steam engine.
Evaporation, device for utilizing the heat and products of, O. L. F. Browne.... 250,707
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Feed water heater and purifier, C. Stewart.... 250,995
Feeder, automatic boiler, E. Lompert.... 250,931
Fence post, T. A. Weber.... 250,858
Fence wire, barbed, T. H. Dodge.... 250,899
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Hinge, gate, D. E. Henderson.... 250,916
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Hoop lapping and pointing machine, C. E. Chittenden.... 250,784
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Horse detacher, W. Walker.... 250,857
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Latch face plate, W. E. Sparks.... 250,849
Latch, gate, S. W. Martin.... 250,742
Lathe, turning, W. O. Smith.... 250,762
Leaf cleaning and scraping machine, M. Pesant.... 250,746
Leather skiving machine, M. A. Holton.... 250,734
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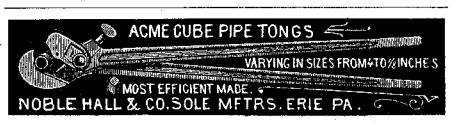

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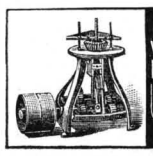

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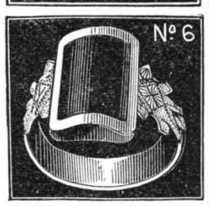

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ROLLED GOLD SOLID JEWELRY makes a **beautiful** and **Valuable Gift** for a lady or gentleman, and in order to introduce our goods and to secure new customers for our Company we will forward **POST-PAID** to any address in the U. S. or Canada, any article of our **HEAVY 18K. "ROLLED" GOLD** jewelry as shown in the accompanying illustrations, on receipt of **THIS ADVERTISEMENT** on or before **MAY 1st, 1882** and **ONE DOLLAR.** On the inside of any ring we send you we will **HANDSOMELY ENGRAVE without Extra Charge** any **NAME, INITIAL, MOTTO** or **SENTIMENT** desired. Descriptions:—No. 1, Ring we furnish in either **AMETHYST, GARNET** or **TOPAZ.** Nos. 2, 3, and 4, respectively, Ring, Gent's Stud, and Lady's Ear Drops are set with our justly celebrated **FRENCH DIAMONDS**, the best imitation of the real stone ever produced, and we defy any one but the cleverest experts to detect that they are not. No. 5 is our handsome **ONYX INITIAL** Ring suitable for either lady or gentleman; the **ONYX** stones we use for settings show both black and white in their composition, and the effect of the engraved initial is very striking and beautiful. No. 6 is our **GLOVE RING** set with either **Red** or **Black Onyx**, something new and very handsome. No. 7 is an **INITIAL CHARM** suitable for either lady or gentleman. On one side we **CUT INITIAL** same as No. 5 Ring, on the other side we use as setting **Red Onyx.** No. 8, **HANDSOMELY CHASED BAND RING.** In the manufacture of all the above described goods we use **Heavy Rolled Gold,** and in offering a **LIMITED SUPPLY** of these goods to the readers of this Paper at the nominal price named, we hope to make **Regular Customers** of them. At the same time we send article or articles selected, we will mail you a bundle of our **CATALOGUES** and feel sure that you will be so highly pleased with goods sent and that they will give such satisfaction that you will oblige us by distributing our Catalogues among your friends, at the same time showing them the **BEAUTIFUL JEWELRY** you have received from us. You can in this way assist us in selling other goods of **STANDARD QUALITY** which are manufactured from **New and original Designs** and which are guaranteed to give satisfaction or **REFUND MONEY.** We depend on our **FUTURE SALES FOR OUR PROFIT.** Remember the jewelry we send you is **Heavy Rolled Gold** and that this unprecedented offer is only made to **introduce** our goods and Catalogues in your vicinity. **OUR COMPANY IS OLD AND RELIABLE,** manufacturing **First-Class** goods from the **PRECIOUS METALS.** We can only send out a **LIMITED NUMBER** of this **FIRST-CLASS JEWELRY** at price named, and in order to protect ourselves from **jewelers and dealers ordering in quantities** we will insert this advertisement but **ONE TIME** in this paper, hence require you to **CUT IT OUT** and **SEND TO US** with your order that we may know you are entitled to the **BENEFITS** of this offer. Under no circumstances will we send more than **ONE ARTICLE** of each kind at price named, but after you receive goods ordered and others are desired we will furnish them in **18k. Solid Gold** at $6.50 each. If you wish **one** article send this advertisement and $1.00; if you desire **two** articles send this advertisement and $2.00, or if **all** (one of each) are desired send this advertisement and $8.00. If **more than one of each** are desired you must pay full price as given in our catalogue. To ascertain the size ring you wear, cut a piece of paper so as to fit around the finger you wish to wear the ring on and send the slip to us. If you order a ring state what you wish engraved on the inside, and if you order either Nos. 5 or 7 state the initial desired. In ordering No. 1 state the stone desired, as we furnish them in either **Amethyst, Topaz or Garnet.** And if No. 6 is ordered state which setting you prefer the **Black or Red Onyx. ORDER BY NUMBERS.** Remember under **NO CIRCUMSTANCES** will we sell more than **ONE OF EACH** at prices named. You can order one or any number up to eight, but **not more** than one of **each kind** and you must **CUT OUT** this advertisement and **SEND TO US** on or before **May 1st, 1882** with your order. Small sums can be sent through regular mail or send by Registered Letter, Money Order or Draft. Address

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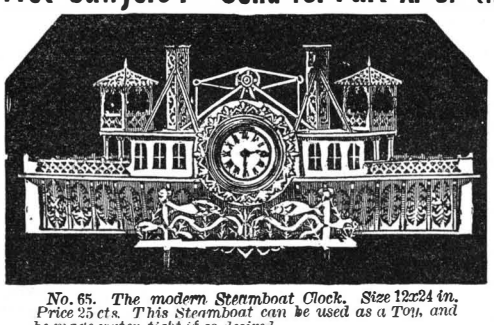

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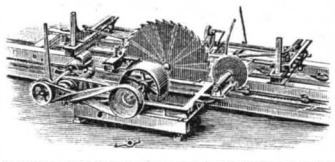

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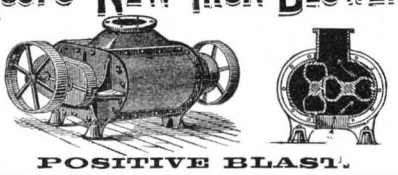

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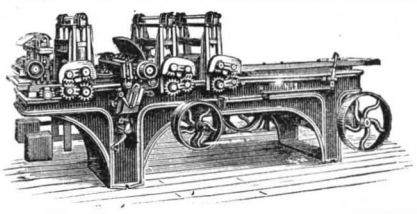

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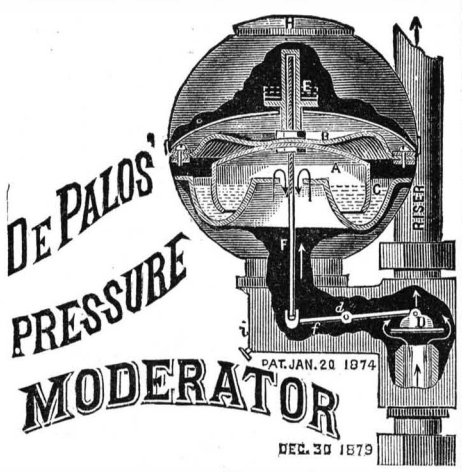

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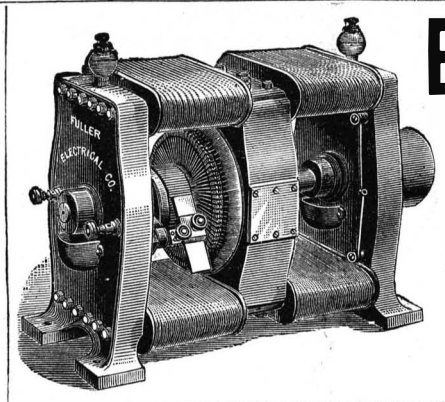

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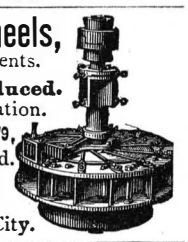

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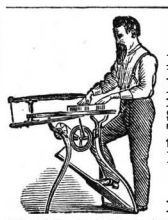

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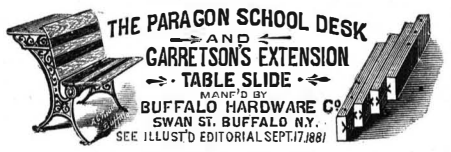

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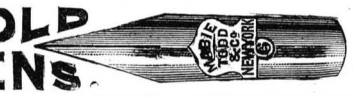

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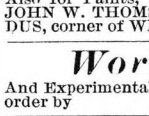

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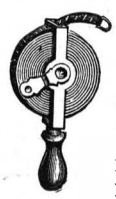

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